NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

ANALYSIS OF T-AH HOSPITAL SHIP INFORMATION
REQUIREMENTS WITH LOGICAL MODEL AND
RECOMMENDATION FOR TRANSITION MANAGEMENT

by

Rickie L. Sosh

June 1988

Thesis Advisor: John B. Isett

UNCLASSIFIED
URITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS
SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; Distribution is unlimited
DECLASSIFICATION/DOWNGRADING SCHEDULE	
PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S)
NAME OF PERFORMING ORGANIZATION aval Postgraduate School — 6b OFFICE SYMBOL (If applicable) Code 54	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School
ADDRESS (City, State, and ZIP Code) onterey, California 93943-5000	7b. ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000
NAME OF FUNDING/SPONSORING ORGANIZATION — 8b OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER —
ADDRESS (City, State, and ZIP Code)	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

TITLE (Include Security Classification)
NALYSIS OF T-AH HOSPITAL SHIP INFORMATION REQUIREMENTS WITH LOGICAL MODEL AND ECOMMENDATION FOR TRANSITION MANAGEMENT

PERSONAL AUTHOR(S)
osh, Rickie L.

TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
aster's Thesis	FROM ____ TO ____	1988 June	153

SUPPLEMENTARY NOTATION
he views expressed in this thesis are those of the author and do not reflect the official olicy or position of the Department of Defense or the U.S. Government.

COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Logical model; Information requirements; Mercy Class Hospital Ship; Logical Model of Hospital Ship MTF; Information Systems of Hospital Ship; Transition Management for Hospital Ships

ABSTRACT (Continue on reverse if necessary and identify by block number)

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DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
2a. NAME OF RESPONSIBLE INDIVIDUAL rof. John B. Isett	22b. TELEPHONE (Include Area Code) (408) 646-2693	22c. OFFICE SYMBOL Code 54Is

D FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

U.S. Government Printing Office: 1986—606-24.

Approved for public release; distribution is unlimited.

Analysis of T-AH Hospital Ship Information Requirements with Logical Model and Recommendation for Transition Management

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MASTER OF SCIENCE IN INFORMATION SYSTEMS

from the
NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

This thesis deals with logical model and information requirements of the new Mercy Class Hospital Ship's Medical Treatment Facility. It compares the currently planned information systems with the logical model. Several alternative methods for satisfying deficiencies are proposed. These alternatives are readily available items and/or enhancements to the currently planned systems. Methods for the development of information system implementation and transition plans are presented.

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I. INTRODUCTION

A. BACKGROUND

As of December 1986, the United States Navy has, once again, a dedicated hospital ship, the USNS Mercy. The Mercy, pictured in Figure 1-1, and sister ship USNS Comfort, which recently entered service, comprise the Mercy Class Hospital Ship (T-AH). These ships are converted San Clemente class (106,618 ton) supertankers and have been assigned to the Military Sealift Command (MSC).

These 894-foot tankers were determined to be ideally suited for this conversion. Their long, parallel midbody provided a large open space for the installation of habitability and modularized hospital units, thereby reducing the cost of conversion. (See Appendix A for diagram.) These tankers provide a sustained speed of 17 knots and a range of 13,420 nautical miles allowing operation with other elements of the Navy. (T-AH Information Manual, 1986)

Each Mercy Class Echelon III medical treatment facility (MTF) contains 1,000 beds allocated as; 80 intensive care beds, 12 operating rooms, 20 recovery room beds, 280 beds for intermediate care, 120 beds for light care, and 500 beds for limited care. The T-AH class is the largest and most advanced hospital ship ever. Few land-based hospitals can surpass its facilities.

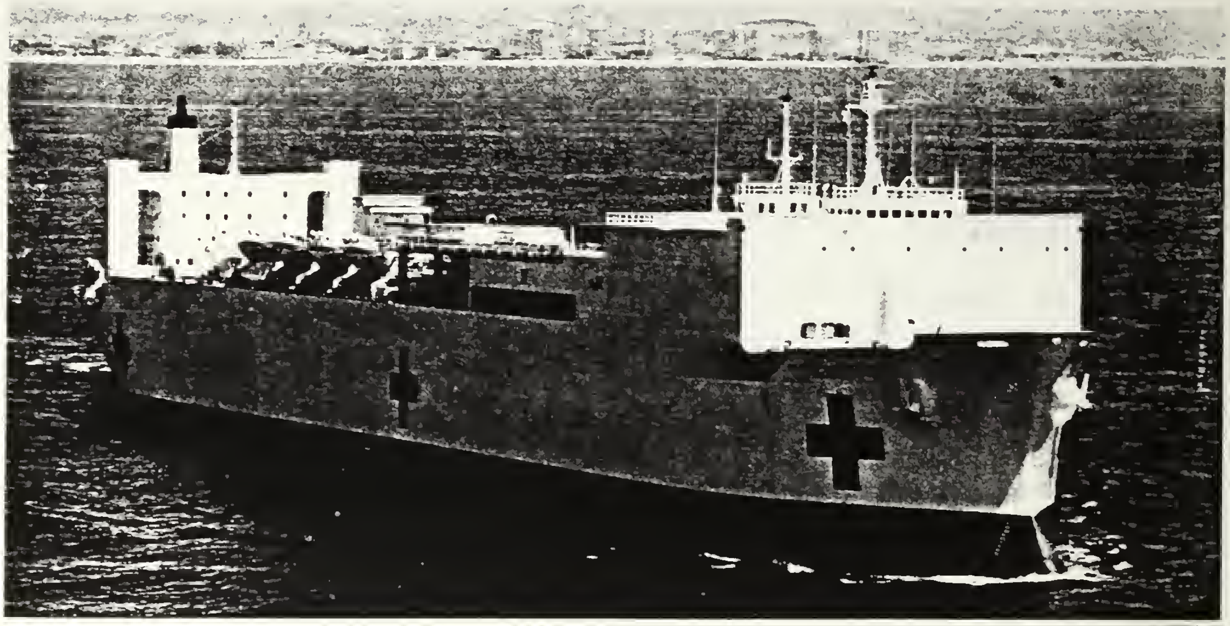


Figure 1-1 USNS Mercy

Not only are these ships larger than any previous hospital ship, they are bigger than any ship in the United States Fleet except for aircraft carriers. The size and the purpose of these hospital ships present a major maintainability, supportability and administrative challenge for the Navy Supply Corps, Medical Corps, Medical Service Corps and the Military Sealift Command. (Ebert & Hess, 1986)

The primary mission of the Mercy class is to provide mobile, flexible, rapidly responsive afloat, acute medical and surgical care. They must support amphibious task forces, Marine Corps, Army and Air Force elements, forward deployed Navy elements of the Fleet, and fleet activities located in areas where hostilities may be imminent.

Due to the flexibility, complexity, and cost of operating the hospital ship at full capacity, three different operating

statuses have been identified. These are called Reduced Operating Status (ROS-5), Full Operating Status (FOS), and Other. At FOS, the MTF will have a Medical Corps Commanding Officer (CO), and during ROS, the cadre will report to a Medical Service Corps Officer-in-Charge (OIC).

The ship and the MTF may be operated at some degree less than wartime or greater than peacetime. Because of its excellent mobility, flexibility, and medical care capability, the ship is available for assignment to other missions resulting from natural disasters, civil wars, mass evacuations, etc. Under these conditions the manning of the crew and the MTF can be adjusted or tailored to meet the requirements. (T-AH Information Manual, 1986)

Between missions, the ships will be layberthed in CONUS, the Mercy on the West Coast, and the Comfort on the East Coast, in a reduced operating status (ROS-5, the '5' indicates that the ships go from ROS to FOS in 5 days). While in ROS, a reduced civilian crew of 21 Military Sealift Command personnel will be responsible for ship security and upkeep of most major plant equipment. A cadre of 40 military personnel, both medical and non-medical, will be responsible for the readiness and maintenance of hospital supplies, equipment, and spaces. The ROS crews will form the nucleus of the expanded FOS crew.

When in FOS, the full 72 civilian and 1162 military crew are available to operate and maintain the ship at sea in wartime (Appendix B provides a MTF staff breakdown). It is not

clear at writing, if the FOS crew will be augmented by a Selected Reserve unit when the 500 non-acute care beds are upgraded to acute care. Also at FOS, the ship is capable of operating at sea under wartime conditions as well as the following:

- o Capable of operating at all required bed capacities.
- o Capable of operating the aviation facility for day and night operations with limited support of helicopters up to the CH-53 type for both delivery and evacuation of patients to other facilities during extended operations off a hostile beachhead. The Mercy Class can accommodate 2 helicopters, but the spot deck was not designed to support an integral helicopter detachment.

The Ship will be under the command of a civilian Master. The Master is the ultimate authority to control the movements of the ship and is responsible for all ship evolutions, including flight operations and replenishments. The Master shall obey and enforce the laws of the United States, the Geneva Convention, and the rules of the U.S. Coast Guard.

The data/information processing requirement for the hospital ships is being supported by the Shipboard Non-tactical ADP Program (SNAP II). Two suites of SNAP II (Harris hardware with peripherals) have been installed. One SNAP II configuration will address routine ship-board administrative, logistic, maintenance, and supply/finance requirements; the other will support the Automated Quality of Care Evaluation Support System (AQCESS). AQCESS is a Tri-Service Management Information System (TRIMIS) which is standard throughout all military MTF's. However, the AQCESS software to date has not

been converted for the Harris hardware. Also numerous Zenith-248 microcomputers systems with SNAP Automated Medical Microcomputer System (SAMMS) software have been installed for stand-alone and network use with SNAP II.

B. DISCUSSION

The Medical Survey Report of the USNS Mercy (13-19 February 1987 OPDEMO Report) found that helicopter availability was essential for large patient transfers and resupply operations. The planned addition of an access port on the starboard side near the waterline will only partially eliminate the access deficiency. The OPDEMO Report also found the Authorized Medical Allowance List/Authorized Dental Allowance List (AMAL/ADAL) insufficient and inaccurate. After these problems are corrected it will still be of paramount importance to use these limited supplies as efficiently as possible.

Since World War II, the U. S. Navy has not been threatened by an attacker with sufficient air and naval forces to jeopardize naval supply lines and support vessels. However, the British in the Falklands War found that today a much weaker opponent using current combat technology can exact a heavy toll. Under the Geneva Convention hospital ships are accorded special protection as non-combatants. However, the Mobile Logistic Support Force (MLSF) ships required for replenishment at sea are prime targets. Therefore all ships

involved or in close proximity, could be in jeopardy during a transfer/resupply evolution.

Initial supply levels and resources onboard are more critical than CONUS MTF's, since resupply is much more complex. In addition, the Mercy Class MTF still suffers from some of the same problems of all CONUS MTF's, i.e., limited dedicated patient transportation resources, slow registration/admission, and inadequate patient evacuation resources.

C. PROBLEM DEFINITION AND OBJECTIVES

Efficient and effective use of all resources delays the need for resupply. It also reduces the requirement for extra patient evacuation flights by properly using the return flight of incoming medical or Search and Rescue (SAR) helicopters. This efficiency could prevent unnecessary exposure and risk to all involved. The first step is to define the information requirements for casualty regulation, management and patient care aboard the Mercy class ships. A logical model of the MTF will assist in the development of policy/procedures, management/training plans, and future T-AH information systems.

As indicated in the OPDEMO Report, training will be another major problem. It may be taken for granted that all medical personnel are pre-trained in their professional capacities. However, most of the FOS crew reporting aboard will be disoriented in the new environment and unfamiliar with

shipboard routine. It will be several days before the FOS crew can become effective in this new environment.

D. RESEARCH QUESTIONS

In view of the above discussion the following research questions were developed:

- o What is the logical data and information flow (logical model) of the T-AH MTF based on potential patient flow, casualty regulation, and the current standards of health care.
- o How do the current and planned information systems compare to the logical model?
- o How may training and orientation be addressed in the transiton plans of the new T-AH health care asset?
- o Also, what alternative methods are available for data capture, display and retrieval?

E. SCOPE AND LIMITATIONS

Comments and reference to T-AH design and capability are based upon the existing conditions at time of writing. Because this is a new, evolving system it will undoubtedly be somewhat different shortly after this thesis is complete. Therefore, only the logical model of the MTF will be examined. The organizational structure, staffing, command and control policies of the Military Sealift Command were not closely examined or reported. Neither time nor availability of resources permitted an in-depth evaluation of specific, current, detail standards of health care within the identified processes indicated by the logical model.

F. RESEARCH METHODOLOGY

A literature search was conducted which included current man-machine interface techniques, accounts of medical support and regulation during the Falkland's War and the Vietnam Conflict. The logical model found in "Information Flows at the Forward Echelons of Casualty Care", developed by the Naval Health Research Center was modified to reflect the expected information flow of the new hospital ships. The capabilities of SNAP II and AQCESS was compared to the T-AH logical model. Interviews with persons in charge of the T-AH ships and policy as well as personnel with past knowledge and experience with combat patient regulation were accomplished. OPNAV and NAVMED-COM, surface navy and naval aviation instructions were reviewed. Data regarding the process for planning for the care of combat casualties was collected from unclassified previous Fleet Marine Force training exercises. (Report 86-23)

G. IMPACT OF FINDINGS

The logical model will provide a basis for future general functional requirements applied to T-AH MTF information systems (IS). It will also provide a basis for comparison of current and planned IS. The logical model will facilitate the development of communication, orientation, training, and management plans.

It is obvious that many organization and management theories from corporate business apply to MTFs. Information

systems as a subsystem of the organization is identified. Transition management, a relatively new approach to controlling organizational strategic change is applied to the T-AH MTF. A brief method to ease transition planning is proposed. The impact of IS on the transition strategy of the MTF is identified. In general, the reader will have a more detailed picture of the transition and management complexity surrounding the multi-mission environment proposed for the T-AH MTF.

H. THESIS CHAPTER SUMMARY

Chapter Two identifies general management theories and various subsystems within the organization. It introduces the relationship between Information Systems Technology and the organization. It identifies the importance of the logical model. It also, introduces transition management and it's importance to the multi-mission environment of the hospital ship.

Chapter Three provides detailed mission requirements and operational capabilities of the T-AH MTF. The logical model is presented and the information requirements are discussed. The model's potential impact upon management and training plans is discussed. Current and planned IS are compared to the logical model and some information deficiencies are discussed. Alternative methods of data collection and retrieval are discussed.

Chapter Four provides previous chapter summaries, recommendations for further study on future hospital ship information systems and conclusion.

II. ORGANIZATIONAL TRANSITION AND INFORMATION SYSTEMS TECHNOLOGY

It is generally recognized that the complexity of assimilating Information Systems (IS) technology into the organization has increased over the last 20 years (Cash, McFarlan, Mckenny & Vitale, 1988). It is therefore essential to examine key organizational issues of management, organizational transition, and IS development. The following discussion emphasizes the impact of environment, culture, technology, mission and goals on the organizational system. Chapter Three will apply many of these concepts and tools to the hospital ship. The multi-mission requirement proposed for the Mercy class ships dictates the need for varied change processes or transition plans. Flexible and robust IS are demanded now to cope with the varied potential mission requirements of these hospital ships.

A. DEFINITION OF KEY TERMS

During the following discussion many terms will be used, some unique to one area of study, some common to management, organization and IS development. All organizations and IS strive to be efficient in the process of being effective. That is, they want to do the right thing or provide the right product. But, they want to provide that correct output with the smallest amount of input necessary.

Generally, products and services are produced by or for systems of some type. Systems can be manual or automated. A system is a collection of resources and methods used in an organized manner, comprised of two or more interdependent parts or subsystems and delineated by definite boundaries from its environment. Systems can become so complex that understanding them is difficult. Therefore, modeling is used to decipher the mysteries of systems. Models, like blueprints, are built to communicate an idea or conceptualize a complex system or component. Models make excellent communication tools.

> A blueprint is, of course, relatively easy to change; it exists only on paper. The blueprint is a logical representation of the building. It is much closer to the physical structure than an engineer's rough sketches were, but it is still a logical model. (Davis, W., 1983)

B. ORGANIZATIONAL ISSUES

1. The Organization

Some organizations are informal and others such as the navy, a ship, corporate business, or hospitals are formally structured. Organizations can be different in many ways, but each has a goal or mission. Organizations must acquire and allocate scarce resources to achieve their goals.

> Organizations are not self-contained, but always exist in an environment with other organizations that they depend on for the resources they need. Organizations will all have leaders or managers responsible for helping the organizations achieve their goals.(Stoner & Wankel, 1986)

2. Management

Management has been well studied since the 1700's, but still no one definition has been universally accepted. Stoner and Wankel (1986) define management as:

> ...the process of planning, organizing, leading, and controlling the efforts of organization members and of using all other organizational resources to achieve stated organizational goals.

Over the years there have been many management theories and schools of thought such as, classical, behavioral, management science, and most recently, contingency. However, according to Stoner & Wankel (1986) none of these approaches have dealt adequately with all the important aspects of organizational life. The problem may be that they were not wrong for their time. They were merely trying to study an evolving and learning entity, the social organization, with an evolving science. Kast & Rosenzweig (1979) alluded to this when they resurrected the General Systems Approach for organization and management which had its beginning in the 1950's.

3. Systems Approach

This approach is a conceptual scheme, which views and facilitates analysis of the dynamic social organization via its interrelated parts, called subsystems. The systems approach allows the study of individuals, small-group dynamics, and large-group phenomena as impacted by the environment. (Kast & Rosenzweig, 1979)

One of the greatest advantages of the systems approach is its use in conceptualizing the impact of the environment upon the organization. This approach seems ideally suited for studying open systems, which are systems that interact with their environment. Military organizations are open systems, which are particularly sensitive to the environment. Therefore, military organizations make excellent subjects for this approach.

Using the systems approach Kast & Rosenzweig (1979) created a model (K&R) of an organization, a model which is appropriate for any organization engaged in a wide variety of activities and functions. The K&R model depicts the organization as composed of several major subsystems existing within an environmental suprasystem. This organization is constrained by the environment but also influences it. Figure 2-1 indicates that the five major subsystems possess definite system boundaries which are semi-permeable to influences of the other subsystems and the environment.

It is important to recognize what each subsystem impacts and represents. It will be necessary to identify the correct system which requires change and select the proper change mechanism during the development of the hospital ship transition plans. Therefore a brief synopsis of each subsystem is presented.

a. Goals and Values Subsystem

Goals represent the desired future conditions that the organization wants to achieve. They impact upon the

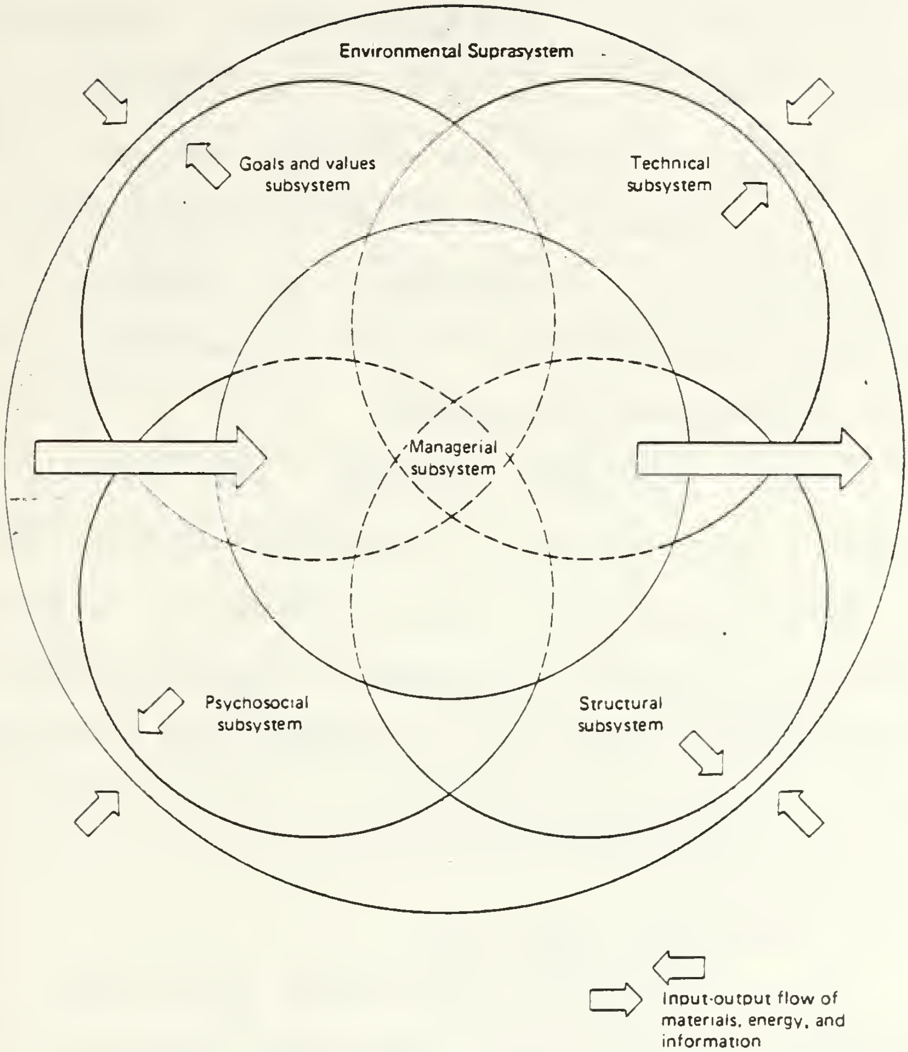


Figure 2-1 The K&R Organization Model (Kast & Rosenzweig, 1979)

environment and in turn are acted on by the environment. Goals include mission, objectives, quotas, and deadlines. Goals of the organization must be able to co-exist with individual values. Organizational goals can be classified as either

official goals or actual operational goals. Official goals are stated in broad terms to justify the existence of the organization. Actual goals, i.e., objectives and deadlines, are those conditions which are actively pursued. Goals and values must be in harmony with the social and technical aspects of the organization. Management is responsible for the alignment and control of goals. (Kast & Rosenzweig, 1979)

b. Psychosocial Subsystem

This subsystem contains the culture of the organization. It consists of individual behavior, motivation, status, role relations, group dynamics, attitudes and expectations. It adapts to changes in the environment. It is greatly affected by technology, structure and management. The cultural or psychosocial subsystem is a major influence upon a changing organization.

c. Structural Subsystem

The structure establishes the formal lines of communication as identified in the organizational charts. It is primarily concerned with authority, position, communication, and work flow. It provides formal liaison between the management, technical, and psychosocial subsystems. However, informal communication which disregards the formal avenues is of equal importance in most organizations.

d. Technical Subsystem

This subsystem includes all the knowledge, tools, equipment and techniques used to produce the organizations

outputs. Figure 2-2 depicts a simple model of an organization as an open system. This corresponds with the essence of the technical subsystem, material or information is input, transformed by some process, and then output. It is understandable why Information Systems' profound effect on organizations began in this subsystem. The activities indicated by Figure 2-2 are the fundamental activities of a single information system. Hence, the Open System is composed of many IS (automated or manual) which must pull together to achieve organizational goals.

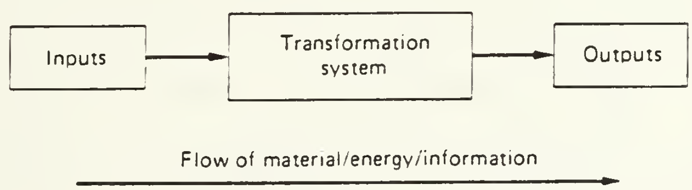


Figure 2-2 The Open System

IS were introduced first in the areas of the organization where information was strategic. As the technology of IS improved (increased dependability and cost effectiveness) and competitive pressure increased, they became pervasive throughout management. Organizations where information is strategic to its goals, i.e., banking and airlines, are completely dedicated to IS in the 1980's. IS and organizations have grown together in the last 20 years. Part of the increased complexity of organizations of today is due to

the predominance of IS. The technology subsystem influences the structure of organization and hence the management subsystem. (Cash, et al., 1988)

e. Management Subsystem

> This subsystem spans the entire organization by setting goals, organizing people, directing technology, developing strategic, and operational plans, implementing plans, designing the structure, and establishing control processes. (Kast & Rosenzweig, 1979)

Then management must relate this dynamic organization to an ever changing environment. This is why many organizations concentrate on adaptive management and coordination techniques. Short and long term strategic goals must be harmonious with the culture of the organization. The goals must be supported by the correct technology. Organizational technology must maintain a competitive balance with the industry. The structure must provide the formal authority and communication pathways, but be flexible enough to allow coordination of effort.

Information Systems affects this subsystem to a high degree. IS have become the managers greatest productivity tool of the 1980's. IS have radically changed the balance of power between competitors and buyer-supplier relationships (Cash, et al., 1988).

> ...for efficiency and for effectiveness, IS in the 1980's must include office automation, data and voice communications,and data processing, all managed in a coordinated and (in many situations) an integrated manner. (Cash, et al., 1988)

Therefore, to update the K&R model, which was developed in the early 1970's, to depict management control of the 1980's it is necessary to adjust the model slightly. Figure 2-3 depicts the expanding influence of IS, when used in a coordinated and integrated manner, upon the management subsystem. The model now indicates that the management

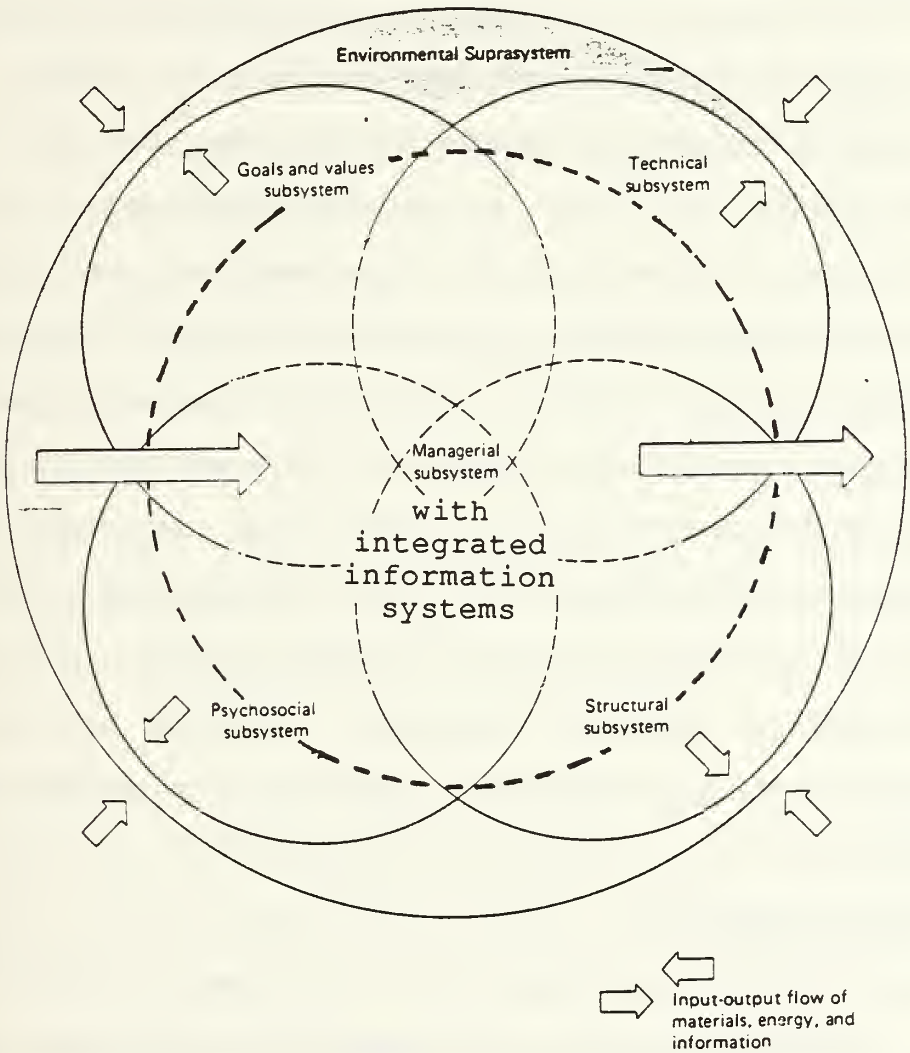


Figure 2-3 The Modified K&R Organization

subsystem has greater control and coordination of all other systems and can facilitate a higher degree of efficiency and effectiveness. In the 1980's IS are no longer considered merely an asset within the technology subsystem. They are now considered rapidly changing, but essential fundamental tools to management.

C. INFORMATION SYSTEMS

Indeed the essence of IS can still be seen in Figure 2-2, but that model is too great a simplification for today. The list of advances made only on the input side, now called man-machine interface, of that model can fill volumes. One hesitates to say, "no we can't do that" because next month you may find an advertisement for that very product or service. No manager of the '80's wants a New York size telephone book computer report. It is not usable. If the manager or health-care-provider needs more detail than his one page summary report shows, he requests it. But, just what tools are available to the manager of the late 80's & 90's? How and why have the software products improved? Finally, how does the organization or Mercy Class MTF assimilate new or emerging IS technology?

1. Manager's Tools

The foremost new asset of the manager in the 80's has been his computer literacy. This awareness and more accurate expectation has allowed the manager to recognize his

requirements earlier and express them to the information system designers.

Many types of man-machine interfaces, e.g., bar code and keyboard, are in common use. These technologies were a leap ahead in the 1970's and early 80's. Bar code is still heavily used in inventory management. However the manager needed a faster more efficient input method that was adaptable to different environments.

Speech technology has been used for many years in research and communication devices for the handicapped. It is now being studied for use by the navy in aircraft and helicopter control systems. There are four types of speech recognition systems, dependent, independent, discrete and connected. Dependent speech systems require samples of a potential users voice to function. Independent speech systems contain algorithms which can handle different voices. Discrete speech systems identify words and require the user to pause a tenth of a second between words, while the system searches memory for a match of that word pattern. Connected speech systems do not require a specific pause but are trained to the user and use an algorithm to determine word boundaries. When dependent and discrete technologies are coupled in the same device 95-98% accuracy can be achieved. Connected speech is less reliable at about 90% accuracy. (Poock, 1986)

About 20 to 30 minutes are required to train these speech systems and they should be trained under the same

environmental conditions required for use to get the best results. One of the big differences in these systems is the vocabulary they can store. Generally, the larger the vocabulary the higher the price. For example a 1,000 word discrete speech system is available from Dragon System for under $1,200. When used with a noise cancelling wireless microphone they are extremely convenient. This allows the manager to walk around the factory floor and still use the computer. (Poock, Winter 1988)

Another similar device is a handwriting digitizer which must also be trained to the user. This utilizes a thin flat sensor plate and sometimes a special pen connected to the sensor plate, e.g., Personal Writer. During a training session it converts specific patterns and pressure exerted by the user to memory. Later these patterns can be matched. It works well for handwriting and limited graphics. This device has one advantage over the speech recognizer, a copy of the data is written on paper at the time of entry which provides an excellent audit trail. On the other hand they are not as convenient as voice recognizers and are limited in mobility due to a required cable attachment. (Macworld, 1988)

The military and hospitals depend on many standard forms. Facsimile transmission (FAX) digitizes these forms or graphics to send or receive information. This is relatively old technology but resolution and reliability have improved in the last few years compared to a decrease in cost.

Optical Character Read (OCR) technology has also improved. OCR's scan text and convert it into a format readable by word processors. OCR's were limited in the ability to process many different font types. Now they can read and convert most any type of font and some dot matrix print. Now it is possible to scan and send pages using FAX and process them using OCR software on a personal computer. Scanners are available to do both OCR and FAX, the data from both can then be merged, edited or manipulated and printed by OCR software. Typical scanners provide 300 dots per inch resolution which is adequate for most uses except design and engineering. (PC Magazine, 13 October, 1987)

Advancement in data display have made laptop computers common place. A recent entry into the market is the gas plasma display, which provides small or large flat screens with resolution better than Liquid Crystal Display (LCD). (PC Magazine, 27 October, 1987)

Almost in common use today are local area networks (LAN).

> A LAN consists of a set of nodes connected by a set of links. The nodes and links can cover a small geographic area, ranging from a few feet to a mile. The nodes may be printers, microcomputers, or mainframes. The links are coaxial cable, twisted pair wires or fiber optic cable. (Schneidewind, 1986)

LAN's generally require a special board interface and licensed software.

The manager has integrated word processing, electronic spread sheets, networked data communication, data base management systems, corporate data bases, graphics, spellers, thesaurus and electronic mail for local network or global use. All these tools have made the manager more efficient and farther reaching in his tasks.

In this age of global thinking and adaptive environments, quicker, more accurate decisions are required from the manager. These decisions are more vulnerable than ever before. The manager requires assistance with these decisions and has requested Decision Support Systems (DSS). A DSS, at the very least, summarizes for management review millions of pieces of information which can be drawn from local or networked data bases. The DSS can analyze or evaluate the information based on manager selected criteria. Only this filtered summary information required for decision making need be seen by the manager. When specialized knowledge is required to filter or assist in selecting management alternatives Knowledge Base systems are available.

Knowledge-based systems provide facts, values, assumptions and rules of thumb within specified domains of interest. When even more specialized knowledge systems are required, Expert Systems (ES) are available which provide a level of expertise associated with human experts in specific tasks, e.g., contracting, aerodynamic design, classification, and rudimentary diagnosis.

A manager can maintain or acquire a competitive edge through the use of interactive and heuristic DSS supported by several specific integrated expert systems in association with numerous data bases of information. (Bui, 1987)

2. System Development

The development process of information systems has seen remarkable improvement. The technical hardware engineers have been turning out faster and cheaper memory chips, faster internal buss designs, and miniaturized computer components. Many personal computers have more capacity than main-frame computers from the 60's. This trend will continue because there is a demand for faster, cheaper and smaller. However, the cost of computer software has increased.

The quality of software has increased by the application of relatively new structured techniques (Page-Jones, 1980) & (Yourdon, 1985). This idea of structured techniques is called step-wise refinement by Davis (1983). At the heart of this technique is the fundamental necessity of conceptualization.

Modeling or conceptualizing the information requirements is an iterative technique (Davis, 1983). Page-Jones and Yourdon identified the Data Flow Diagram (DFD) as a communication mechanism to reduce misunderstandings between the user or proponent of a system and the information system analyst/designer. The DFD with its unique diagrams (circles, boxes, triangles) can be used to model the flow of information

from one source, activity or process to another. The analyst/designer draws and redraws these diagrams until it meets the conceptual expectations of the information system in the mind of the user. When complete this DFD plus detail data characteristics, and the details about the data transformation processes will provide the information system designer the baseline knowledge required to design the system.

Usefulness of the DFD or logical models is not limited to the information systems design. Many management problems, or ideas can be resolved, studied and communicated via logical models. The solution to every management problem is not always automation. However, the same steps taken to create information systems can be used to resolve management problems, i.e., problem statement, analysis, logical models, alternative selection, design, create, test, and implement.

3. Assimilation of IS Technology

Cash, et al., (1988) indicate that the organization should merge and integrate the three islands of IS technologies: office automation, data & voice communication and data processing. Also, they insist that the organization can be put at great risk if IS policy and management control is not consolidated. They cite the following key reasons for merger:

- o Decisions in each area involve large amounts of money and complex evaluations. The technical disciplines are similar and require similar staff skills for proper analysis.
- o Great similarity exists in the type of skills required to manage and implement IS applications.

- o Many IS applications require integrated technological networks to facilitate a technology merger.

It must be observed that regardless of the merger of responsibility. The IS manager's organizational position must be such that he has knowledge of and influence on the organization's strategic goals. Thus, the IS manager can work to prevent inadequate IS capabilities which might restrict the organization's ability to respond to shifts in the environment. This is why many organizations place the IS manager on strategic planning committees and boards.

Based on studies, and work by previous researchers, Cash, et al., propose IS assimilation in four phases; investment/project initiation, technology learning and adaptation, rationalization & management control, and maturity/widespread technology transfer. These phases can be grouped in two broader categories.

> Phases one and two are called the innovation phases. Phases three and four are called control phases. The difference between them can be described as forecasting, assessing, learning, creating, and testing (innovation) versus general usage, acceptance and support (control). (Cash, et al., 1988)

a. Investment/Project Initiation

Phase One begins with the a decision to invest in a new IS technology. Several projects will coincide with this effort, i.e., investigation, requirements analysis, conceptualization, cost/benefit, facility preparation, and initial training. (Cash, et al.) indicates that in retrospect

these activities and resulting systems will appear clumsy. This is because a tremendous amount of learning has taken place during development. Experience in IS project management can determine the difference between a successful project and the expensive failures. Phase Two will follow Phase One unless disaster befalls the project during Phase One. Possible hazards to avoid are; poor user (functional) involvement, no management support, vendor failure, discovery that the proposed IS conflicts with the (or a) strategic goals of the organization. Some symptoms of possible development or implementation failure are; project is ambiguous with no perceived benefit merely more work, avoidance of the system by users, large cost overruns, very high anxiety levels in targeted users and project management. "The complexity and time required for implementation of new IS technology normally hides the perception of development failure for 18 to 36 months." (Cash, et al., 1988)

b. Technology Learning and Adaptation

Phase Two, typically called post implementation adaptation by most IS managers, involves learning how to adapt the new technology to additional tasks or tasks that are related to primary reasons for the new technology. For example, a clinical records supervisor discovers that a weekly workload summary report requiring six hours of manual investigation and typing is available as a spot summary report from the new system. If the new system is accepted by the

users. They will find more uses for the system by themselves. More of the old way will disappear and merge into the new, this attitude should be encouraged by IS management but not forced. Watch for similar rejection symptoms as identified for initial implementation. If they do not occur and some adaptation does, then Phase Three can begin. "Be aware stagnation can occur at any phase." (Cash, et al., 1988)

c. Rationalization & Management Control

Phase Three is characterized by realignment of the organization with the newly accepted IS technology. On various levels this may mean changes in responsibility, supervision, and increased control. In short, changes in the organizational structure follow new IS technology implementation. The potential failure in this stage is too much control, striving for efficiency at the cost of effectiveness. Control is necessary, but do not become so focused on standards and procedures that the user loses enthusiasm for the new technology. Innovation by the people is one of the greatest assets in some organizations. In other organizations, innovation is the basis for the their competitive edge. Phase Four will follow, if excessive controls do not destroy user interest. (Cash, et al., 1988)

d. Maturity/Widespread Technology Transfer

Phase Four, this final phase, "...indicates technological diffusion. Here firms take the experience gained

in one operating division and expand its use throughout the corporation." (Cash, et al., 1988)

Many IS managers do not think this phase exists or is attainable. This belief is due to the rapid rate of technology change and no foreseeable slow down. Plus the willingness of business (and military) to accept the new, better, and more efficient system to maintain the perceived competitive edge. Most IS managers believe that any experience gained from failed projects or successful ones is beneficial and can be applied to current projects or future ones.

D. ORGANIZATIONAL CHANGE

Chapter Three will discuss the following organizational subsystems as part of transition management and provide a method of creating a transition or change plan for the Mercy Class MTF. But first, the reader must fully understand the subsystems and their change agents. This section identifies the subsystems and lists their change agents, many involve the use of IS. This allows selection of the proper change agent or activities to achieve the desired results in the Hospital Ship transition plans. The ship's transition plan activities must be specific. The time available to execute the plan is uncertain, but it will be limited to the sailing time required and the five day FOS transition.

The Mercy class MTF must adapt to align itself with the multi-mission requirement.

> If a system is not functioning in response to its environment, it may decrease in effectiveness or decay and disorganize. Systems and their goals are not stable; they change because of goal displacement, organizational learning, or specific change procedures. (Davis & Olson, 1985)

Goal changes are natural but they must be recognized to be controlled. Then technical and structural changes can be implemented in agreement. Cultural changes may also be needed, but the organization's culture adapts more slowly than technology.

Organizational learning is adaptive behavior. It is the process by which the organization identifies action and outcome, identifies and corrects errors, then stores its experiences in directives, rules, and information systems, which train new personnel. Organizational learning can be facilitated by management practices, the cultural environment, and learning mechanisms, i.e., planning systems, formal training, information systems, procedures and regulations. (Davis & Olson, 1985)

1. The Tichy Model

Tichy believes a balanced perspective will provide a greater capacity to manage change.

> Many organization development practitioners' overreliance on a purely cultural orientation has limited their use of other change approaches, especially those derived from the organization design and management fields. (Tichy, 1983)

He devised a model which involves three problem areas; technical design, political allocation, and cultural problems.

Figure 2-4 depicts Tichy's view of these areas as a strand of the organization's "Strategic Rope." From outside the organization this rope appears as a single, complete, entity. But, like a rope if one strand becomes unravelled the organization weakens or experiences pain. These three subsystems will be examined in the hospital ship transition plan portion of Chapter Three.

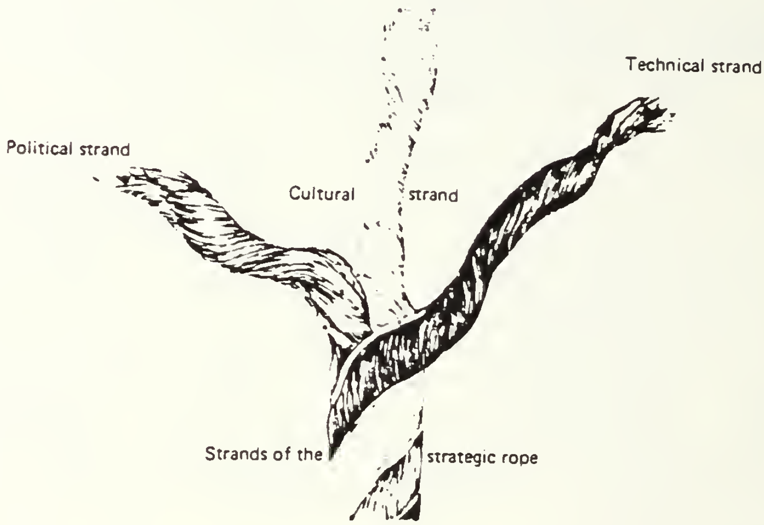


Figure 2-4 Strategic Rope

a. Technical Design Strand

All organizations must face threats and opportunities from the environment. Technical resources must be arranged to deal with and produce the desired output. Management engages in goal setting, strategy formulation, structure formulation, and designs management systems. Technical alignment assumes that the components of the Mercy

Class MTF are interrelated in an effort to achieve effectiveness and efficiency within the environment. Therefore, as the environment changes the interrelated components must realign. The following principle applies:

> An organization is technically effective to the degree that the uncertainty it faces matches its capacity to process information and eliminate the uncertainty. (Tichy, 1983)

However, too much information processing capacity is as dysfunctional as too little, because the management of IS is costly and complex. (Cash, et al., 1988)

Uncertainty in an organization comes from three major sources; environments, tasks, task interdependence. Complex, changing, or unstable environments father uncertainty. Information Systems can both create and simplify such environments. Interdependent tasks such as those found in hospitals which have more than one activity involved with one item (patient) create high levels of uncertainty. As uncertainty increases the need for information processing increases. Organizations are more efficient and effective from a technical point of view when there is good alignment between information processing requirements and information processing capacity. (Tichy, 1983)

The Mercy Class MTF must perform it's multi-mission requirements in a changing and uncertain environment, to which it must adapt. Also, it has a high level of internal interdependency of task. Therefore, the Hospital Ship MTF must

have good alignment between information processing requirements and the capacity to process information.

Two options exist to deal with a poor match between uncertainty and information processing capacity. Option one is to reduce uncertainty by stabilizing the environment or reducing the complexity of the environment. The second option is to alter the tasks and interdependencies by changing the information processing capacity. The banking industry is an example of an industry which developed good alignment via automated information processing. (Tichy, 1983)

Technical change strategies alter the information processing capacity of the organization. The following guidelines can be used in developing a technical change strategy:

- First, examine the alignment between the environment, mission, and the strategy to accomplish the mission. Then make adjustments for proper alignment.
- Then adjust the alignment between mission/strategy and the proposed tasks to carry out the mission. Ensure that the correct required tasks are well documented.
- Adjust the organizational structure to support the tasks.
- Then ensure that the detail processes involved with the tasks are aligned with the correct required tasks and the organization.
- Finally, adjust the personnel to align with the processes and the organization.

If these steps are taken, Tichy indicates that the technical subsystem will be aligned with mission/strategy and the organizational structure. Note that the technical change

strategy must be specific for each Hospital Ship mission. This will be expanded in Chapter Three. (Tichy, 1983)

b. Political Allocation Strand

Organizations expend much time and energy in allocating power and resources within an organization. Major decisions surround these issues, which involve reward programs, budgets, expansion programs, career decisions and the internal power structure of the organization. Unlike the technical area the tools and concepts for political decision making are less formal and less obvious. Regardless, a tremendous amount of management effort surrounds strategic political issues, e.g., changes of Commanding Officers, vendors and contracts.

Tichy states, "...organizational behaviors are shaped by political bargaining, where the executive is the political broker, which guide the allocation of resources." Survival and growth are the political goals. These contrast sharply with the technical desires for efficiency and effectiveness. Political bargaining is just as prevalent in the military organization as it is in corporate business. This political bargaining process with its ensuing conflicts must be managed. (Tichy, 1983)

Political uncertainty varies due to changing; environments, organizational goals, and the means for achieving the goals. Political uncertainty can be expected to be high during Hospital Ship FOS transition. Political uncertainty and the bargaining capacity must be controlled. Two options are

available; control the political environment by tighter regulation or insert key personnel, and the second weaker but more harmonious option is to determine goals by consensus. Obviously, the second option is not always possible nor is it highly favored by the military.

Tichy has developed the following political change strategies:

- o First determine the level of political uncertainty in the present structure. Then estimate how it may be impacted in the process of moving to the desired future state.

- o Since political strategy is constrained by cultural norms, link the desired state with the culture. Training and education can be used to get the desired state linked to the culture.

- o The political strategy should reinforce the technical. Determine the leadership style, i.e., democratic, autocratic, or laissez faire which best supports the technical subsystem and strategic goals. But, the style must be compatible with the culture. Training and educational programs can be used to smooth out any slight incompatibilities.

- o Develop the outward image of good political alignment, while vigorously attacking the above three guidelines.

c. Cultural Strand

Tichy states, "organizations are in part held together by a normative glue that is called culture"; culture consists of values, beliefs, and interpretations which are held individually and shared by members of the organization. One of the most difficult tasks preformed by management is to determine what values and beliefs are best suited for the organization and hence, adopted. Most managers make these decisions intuitively or by trial and error.

A culture exists when there are "norms" and values which are: (1) related to specific behaviors, i.e., how workers are treated, and social justification for what people are doing, i.e., providing service or making patients better; (2) accepted by most of the organization or subgroups; and where (3) individuals are aware of and supported by the majority of the organization. (Katz & Kahn, 1978)

To fit new technical tasks or political bargaining into the Mercy Class MTF new cultural values must be adopted by the majority or at least by the individuals most affected. Due to rapidly changing technology, cultural modifications which are slower to develop lag behind. Education and training can speed the adoption of new technical tasks and reducing the resistance to change by lowering this value acceptance barrier.

The core values of the Mercy class MTF are of prime importance. These values must be developed early in the organization's life to give the proper direction for cultural growth. Care must be taken to ensure that the values are in harmony with the strategic goals and technical strategy. In the future, when new values or beliefs are required, the changes will not be drastic. Two basic types of core value vehicles are used. The first is reflected in special terminology, stories, symbols, tradition, and in the creation of role models. The second is reflected in and reinforces the first by, management planning, information systems, and human resource systems (Tichy, 1983).

Management must not expect all attempts to change corporate culture to work as fast as needed or at all. Many attempts will fail because they are not tied strongly enough to the corporate mission. Sometimes it is better to ease in new values by targeting identifiable subcultures one at a time. For example, if administration wants to implement a new ward reporting system then nursing service (specifically its leaders) must be won over first. Then the role models in that subculture will speed the implementation and any necessary cultural adjustment.

Similar to the other two strands in Tichy's model, culture also has its share of uncertainty. First, it is difficult to put your finger on the content of the culture. Second, it is even more difficult to anticipate how the culture will react to a new idea. So, it is easier to classify the Mercy class MTF into one of three types, mechanistic, organic and mixed, of characteristic cultures and then apply general rules. The environment and multi-mission requirement of the hospital ship will require cultural change. The correct culture change agent must be applied to achieve the required change.

A mechanistic culture is a homogenous culture which is buffered from exterior environment. This type of culture is the easiest culture in which to control uncertainty. It may have some if not all of the following characteristics (Tichy, 1983):

o Little tolerance for members who hold incongruent values or ideologies.

- o People who fear vulnerability or have a lack of real risk taking.
- o Manipulative relationships and/or strong conformity and external commitment.
- o Defensive interpersonal relations or defensive norms resulting in mistrust.

Mechanistic culture strategies concentrate upon the classical management principles of planning, staffing, leading, controlling, and coordinating. Basically, they are built on Theory X assumptions which assume men and machines are interchangeable. It is believed that men and machines can be moved around, like chess pieces, to achieve the most efficient and effective performance. Some characteristic mechanistic change strategies are (Tichy, 1983):

- o Highly differentiated and specialized tasks with precise responsibilities and methods.
- o Coordination and control through hierarchical supervision.
- o Communication with external environment controlled by top officers.
- o Strong down the chain of command orientation.
- o Strong insistence upon loyalty to the organization and superiors.
- o High value upon local knowledge and experience.

The organic style culture is more adaptive and maintains a high capacity for managing cultural uncertainty. Some of its characteristics are (Tichy, 1983):

- o High capacity for managing individual differences in values and ideology.

- o People are more oriented toward collaborative relationships with less defensive relationships.
- o Learning oriented.
- o Respect of the individual.
- o Open confrontation of difficult issues.
- o Risk taking and internal trust.

Cultural organic strategies for change center around coordination, communication, education and training programs. Several possible change strategies are (Tichy, 1983):

- o Continuous assessment of tasks and responsibilities through interaction with those involved with function.
- o Coordination and control network via those closely involved with task.
- o Communication relatively open.
- o Emphasis on lateral consultation and advice.
- o Emphasis on overall organizational improvement, task and goal achievement.
- o High value on corporate and professional knowledge.
- o Team leadership.

Of course, there is a mixed mechanistic and organic culture. The hospital ship is an example of mixed culture. Therefore, the specific change agent from the above lists must be matched with the desired change by the transition manager during transition planning. Therefore, transition theory and the transition planning process will be discussed in the next section.

E. TRANSITION MANAGEMENT

1. Transition Theory

Organizational change is necessary and inevitable for the Mercy Class MTF. However, it must be controlled, else it may result in undesired results, tremendous loss of efficiency and/or effectiveness, or in the worst case, chaos. This change requires forecasting and knowledge of the desired future state, which could be a place, condition, state of readiness, or performance one wishes to achieve. It requires an understanding of the current or present state as it relates to the desired state. It requires a process or mechanism for getting from the current to desired future state, which is called the transition state. This process will be called the transition process. (Beckhard & Harris, 1987)

The Figure 2-5 shows the relationships of the transition process. The organizational transition model includes present state, transition process, and desired future state. This model and terminology will be important to the discussion of transition plans in Chapter Three. Where a method for developing Mercy CLass MTF transition plans will be discussed.

Figure 2-5 Transition Process

2. Open Systems Planning

Open Systems Planning is a method of studying an organization by identifying its mission and analyzing relevant variables (within and without) which impact on the organization. This is specifically relevant due to the Mercy class MTF's changing responsibilities and multi-mission requirement discussed in Chapter Three. Beckhard & Harris state "the entire process of open-systems planning might be called a diagnostic process of preplanning." Tichy notes it is useful when:

- o major changes are to be made such as mergers, new top management, etc.
- o ability to perform is impaired by other outside groups.
- o a group is just forming or coming into existence.
- o necessary to unite total organization to accomplish its mission.

All four items above are necessary considerations during (and before) the transition from the ROS to the FOS crew aboard the Mercy Class MTF. Open Systems Planning consists of seven phases:

1. Determine the "core mission" of the organization.
2. Outline the demand system.
3. Outline the current response system.
4. Project the probable future demand system.
5. Identify the desired state.
6. List the activities necessary to achieve the desired state.
7. Define cost-effective options.

Phases one through three deal primarily with the determination of the present state. Phases four and five attempt to deal with the desired future state. Phases six and seven pertain to the transition state.

Phase one, identification of the core mission indicates total emphasis on the number one mission. "An organization's mission is its reason for being; an organization's objectives are its goals, the states it wants to achieve". The core mission of a medical school could be: (1) do biomedical research; (2) train doctors; (3) provide via a teaching hospital the specialty care not available locally. The medical school can only have one clear core mission. Top management can then align its priorities or goal setting to achieve the mission. Phases two through five are simply lists of demands and resources applied. A comparison of these lists provides a deficit list. (Beckhard & Harris, 1987)

The deficit list can be used to create a change plan. The change or transition plan should have the following characteristics (Beckhard & Harris, 1987):

- Relevance; activities are clearly linked to the change goals and priorities.
- Specificity; activities are clearly identified rather than broadly generalized.
- Integration; closely connected parts.
- Chronology; there is a logical sequence of events.
- Adaptability; there are contingency plans for adjustments and unexpected requirements.

3. <u>Transition Strategy</u>

There two basic aspects of transition management: activity planning and management structures. These management structures should be designed to predict, guide, and alter the technical, political, and cultural subsystems of the organization in the most effective and efficient manner. The activities required to reach the future state do not have to resemble any previous or future activities. These activities are simply a means to an end. There must be a decision as to where to intervene first (Beckhard & Harris, 1987):

- o Top management.
- o Systems most directly affected or "Hurting Systems".
- o Temporary project systems created simple to facilitate an activity or change plan.
- o New systems designed to be incorporated in the future state.

There is no absolutely correct answer of where to begin, but experience with similar expected future states should be a great asset.

An intervention mechanism or technology is required to identify the most promising early activities. Some of these are (Beckhard & Harris, 1987):

- o Across-the-board intervention, such as a staff meeting, complete or departmentalized.
- o Pilot project which is linked to the larger system, to try projected changes out in one area, to minimize risk.
- o Organizational wide confrontational meeting, such as a department head think tank meeting.

- o Educational intervention, formalized classes in small or large groups.
- o Creating temporary management structures.

A transition manager must be chosen which has the following attributes; authority or access to authority to mobilize necessary resources, respect of the existing operating systems, effective interpersonal skills. Beckhard & Harris identify several possible managers, the following are the ones which could apply to a military organization:

- o The Commanding Officer; the head of the organization takes responsibility for all change. CO must be closely related to the current system and have the time to invest.
- o Project Manager; an executive manager (line or staff) could be appointed by the Commanding Officer to exercise his authority during the transition phase.
- o Hierarchy; the supervision of transition is given as additional duty to the existing operations officers.
- o Representatives of the Areas Concerned; essentially passes the responsibility to the areas most affected. This assumes that the change is somewhat localized.
- o Natural leaders; sometimes the executive manager will express confidence in a group whose members have had great experience in the required areas of change, or future state.

In summary the manager should (a) define the transition state and required resources; (b) determine what type of management would be most effective; (c) set up such a management structure and any necessary temporary systems; (d) communicate the creation of this structure, its purpose, authority & responsibilities, scope, and resources. The transition is facilitated in most cases by a separate, or at

least uniquely identifiable transition management team. (Beckhard & Harris, 1987)

F. CHAPTER SUMMARY

Examples and uses of different modeling techniques were presented. Which illustrated the importance of modeling and conceptualization as a communication media.

The systems approach of organizational modeling was introduced and utilized because it is well adapted toward indicating the relationship of the environment to the organization and its subsystems i.e., goals & values, psychosocial, structural, technical and managerial. An understanding of the impact of environmental change is necessary to fully understand the complexity caused by the multi-mission requirement placed on the new Mercy Class Hospital Ships. The subsequent discussion of the organizational subsystems indicated the dominating influence of IS on the organization.

New Information System tools were introduced. Tools such as voice recognizers, that the author feels will be of great benefit to the Mercy Class MTF. These will be further discussed as alternative methods in Chapter Three. Methods for implementing and merging IS into the organization were presented. These thoughts will assist the Mercy Class MTF managers in assimilating the current Hospital Ship Information Systems.

One of the most critical aspects of managing the Mercy Class MTF is the transition from the reduced operating status to an operational status. A change model was introduced which identified three subsystems i.e., technical, political and cultural, as the key organizational systems to adjust to realign the Mercy Class MTF. These three organizational subsytems were identified, disussed and a list of organizational change agents specific to each was presented. This allows correct matching of change agents and subsystems which should provide specificity to the transition plans for the Mercy Class Hospital ships.

III. LOGICAL MODEL, INFORMATION SYSTEMS & TRANSITION

First, the physical decription of the Mercy Class MTF Hospital Ship's characteristics, mission and capabilities are completed. This will firmly fix a mental image of the Hospital Ship in the mind of the reader.

Then the logical model of the Mercy Class MTF process is presented. This model will reduce the MTF process to various functional activities and indicate the relationship that exists between these activities.

The information systems, which are currently planned for the Hospital ships, are discussed and their capabilities identified. Then utilizing the information requirements contained in the logical model a comparison is made. Deficiencies are identified. Alternative methods for addressing these deficiencies are identified.

Transition management for the Mercy Class Hospital Ship is discussed. A method for creating transition plans is identified.

A. MERCY CLASS HOSPITAL SHIP DESIGN DETAILS

In support of the primary mission stated in Chapter One, the Hospital ship shall be capable of the following major Required Operational Capabilities (ROC) (OPNAVINST 3501.161A):

- o Receiving patients suffering from wounds, disease or non-battle injury primarily by helicopter and boat while anchored or underway.

- o Support/conduct Search and Rescue (SAR) operations in a combat/noncombat environment (primarily by boat).

- o Providing surgical and medical care to patients until they can be returned to duty or evacuated to other overseas acute care facilities or to continental United States (CONUS) for further treatment.

- o Providing a safe, stable, mobile platform out of imminent danger for carrying out the assigned mission.

- o Operating a full medical treatment facility (MTF) at sea, day and night.

- o Capable of extended operations off a hostile beachhead and capable of providing aviation facility for day and night operations with minimum support for helicopters for both delivery of wounded for treatment and evacuation of patients to other facilities.

- o Capable of deployment within five days from issuance of mobilization orders.

- o Capable of fueling-at-sea (FAS) from other ships.

- o Capable of receiving and delivering dry cargo (supplies, provisions) by Vertical Replenishment (VERTREP), Connected Replenishment (CONREP) or by boat.

- o Capable of remaining in a continuous Condition of Readiness III at sea for a sustained period of not more than 60 days. (Although a 30 day Authorized Medical Allowance List/Authorized Dental Allowance List (AMAL/ADAL) was planned, NAVMEDCOM-22 recently upgraded this list).

- o Capable of performing all other functions for which the ship or MTF is assigned responsibility.

Other MTF design assumptions addressed in the T-AH General Information Manual:

- o There would be a two to nine day period from admission to discharge, with an average stay of five days.

- o The maximum patient flow rate, on which the helicopter facility and casualty reception areas were designed, would be 300 patients per ship per 24 hours. This would peak at 50 patients per hour.

- o The average patient flow rate, on which the balance of the MTF was designed, would be 200 patients per day per ship. (1,000 patients divided by five days).
- o 60 percent of the patients received would require surgery.
- o Appendix C provides the planned patient flow.

The 1,000 bed full operating capacity, and above operating requirements are supported by an impressive amount of equipment, capabilitity and number of personnel. A brief synopsis of MTF capability is provided in Appendix D.

In support of the secondary humanitarian mission the hospital ships can be manned as required for that mission. The ship can be at FOS but the MTF can remain at ROS. This would allow a tailored MTF crew to be put aboard to meet special mission requirements. The ship could take part in coordinated multi-service combat unit training exercises with a reduced crew to decrease costs and still reap tremendous operational experience.

Information regarding the multi-mission requirements, capabilities, support areas, and manpower has been presented to help the reader form a mental image of the hospital ship MTF platform. The main goal of the MTF is to preserve the life and if possible return to duty experienced human combat resources. This is basically a people process. Patient-care-providers using their skills, knowledge and technology repair the damaged patient or casualty. But there must be a process, system or sequence of events to do this effectively.

B. **LOGICAL MODEL**

As discussed in Chapter Two a logical model is a conceptualization of how a process, system or organization functions. The logical model to be presented outlines the Hospital Ship MTF information and patient flow. It was prepared from information gathered from conversations with MEDCOM-22, general information manuals, site visits, and interviews with the OIC's of both Hospital Ship MTF's. It was not within the scope of this thesis to reduce the information flowing between processes or activities to its data items. The logical model presented is not a Data Flow Diagram (DFD), per se, as a DFD would show much more data detail and be of limited management use.

1. Presentation & Discussion

The logical model (Appendix E) of the Hospital Ship MTF contains an extensive set of diagrams. For simplicity only the context diagram (highest level DFD) is repeated in Figure 3.0 and will be discussed in the thesis. Detail discussion of each process in the overall logical model is also contained in Appendix E.

2. Hospital Ship Information Requirements

The Hospital Ship MTF information requirement begins well before the arrival of casualties. Information about the operational environment, threat, medical intelligence, identification of the task force or area commander coordinating the action, type, number and availability of planned evacuation craft are essential to MTF management and resource planning.

Of course, a few casualties regardless of mode of arrival will not negatively impact the effectiveness of the MTF. However, if MTF manpower was already strained due to an emergent requirement to establish a Beach Evacuation Station (BES) or a Helicopter Evacuation Station (HES) ashore, then a large group arrival of unexpected non-ambulatory casualties could stress the MTF (OPORD, 1983). Conversation with MEDCOM-22 confirms this task may be placed on the MTF. This information deficit and others are possible due the communication limitations placed upon Hospitals or Hospital Ships by the Geneva Convention. (Draper, 1958)

Although, the Geneva Convention affords a measure of protection to the ship it restricts the use of coded messages between the ship, combatants, ambulance craft, and support ships. Also the Convention stipulates that to be afforded full protection the Hospital Ship's port of departure, destination and location must be made public (Draper, 1958). In this day of high technology weapons all combatant platforms will shy away from that public exposure. The possible environmental threat scenarios are so complex and numerous that the relationship of the Hospital Ship to fleet operations would be an excellent topic for war gaming research at the Naval War College.

Referring to the logical model (Figure 3-1) the casualty or humanitarian patient enters the MTF via the side port access or by helicopter. The patient will then follow the

flow indicated in Appendix C. This patient flow drives the information flow as indicated by the logical model. However patient information is pervasive and spreads throughout the MTF, to the unit commanders, and to outgoing reports. The logical model indicates a varied source of casualties depending on the mission and situation.

Figure 3-1 shows seven numbered and labeled circles or bubbles identifying the MTF processes. The rectangular boxes indicate the source or final destination of the information. The arrows indicate the direction of information flow. Two headed arrows indicate information flowing in both directions. The parallel lines indicate data stores which could be files, records or filing cabinets. Information can be drawn from, deposited in or withdrawn for update and returned to data stores during each process.

a. Casualty Reception

Casualties or patients may be received from different sources indicating various levels of prior treatment. As casualties arrive they enter "1.0 Casualty Reception", litter patients are taken by elevator or ramp to the casualty reception compartment. Ambulatory patients are directed to casualty reception by ramp or elevator. Prior information regarding the number of litter patients is necessary to make this as efficient as possible. Rapid movement of patients is necessary to speed treatment, to free the receiving area for

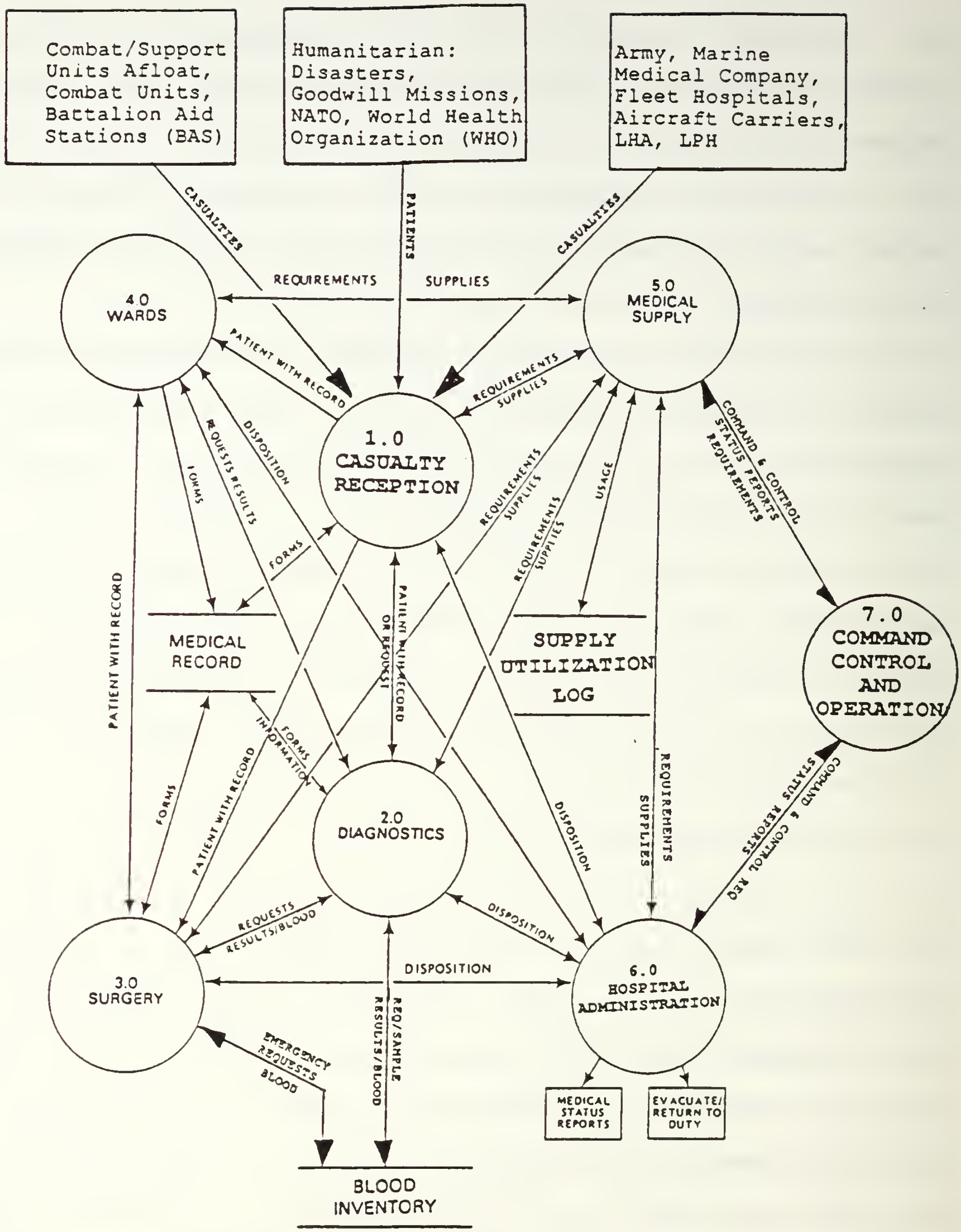


Figure 3-1 Context Diagram

more arrivals, and to remove the patient from the elements. Patient data collection from dog tags or the U.S. Field Medical Card (DD1380) starts immediately upon arrival.

The DD1380 or patient record if available will provide prior triage category and treatment information. Resuscitation and treatment begins while identification and previous treatment information is taken from all available sources e.g., the patient, DD1380, or medical record. Patient identification is used to complete admission and registration forms recording patient presence at the MTF. This information is sent to "6.0 Hospital Administration." An identification wristband is created for future patient identification. A chart or medical record is created from standard medical record forms e.g., Abbreviated Medical Record (SF589), Doctors Orders (SF508), Vital Signs Record (SF511), Shock/Trauma Record, Blood Transfusion Request (SF518), and other diagnostic test requests for effective continuity of care. The absolute minimum identification required on a form or wristband is a unique patient registration number. However, the FMF Medical Information Systems Requirements Definition Workshop identified the following information as required at all echelons of care for patient identification; name, SSN, unit, allergies, blood type and religion. These are the data usually recorded on the common Dog Tag. Still, many minutes are required to record patient identification and vital treatment data.

Generally, blood specimens and lab specimens are collected and transported to the laboratory, "2.0 Diagnosis," while the patient is in Casualty Reception. X-rays, if required, are ordered from Casualty Reception and the patient may proceed to "3.0 Surgery" from Radiology, "2.0 Diagnosis," or return to Casualty Reception.

Depending on the severity of injury and availability of resources, after initial treatment and admission the patient may be sent to the "4.0 Wards" for later surgery, treatment, tests or X-rays.

As consumable supplies run short in Casualty Reception requests for supplies are sent to "5.0 Medical Supply." These requests may be sent verbally by telephone in emergencies or sent by runner on standard forms. The requested supplies (if available) will be delivered by supply personnel.

b. Diagnostics

The bubble "2.0 Diagnostics" represents all the processes involved in Radiology, Blood Bank, Main and Stat laboratories. Requests for services could be sent from any patient treatment area. Except for Radiology the other diagnostic areas may never see the patient. Their only contact is via the request form and lab sample. Radiology may verify that the proper radiographic procedure is being done on the correct patient by comparing the wristband. The Blood Bank and the labs depend on specific information on the specimen and lab request. Basically the patient information on the sample and

the request must completely agree. The specimen must be adequately identified and generally a single patient registration number is not sufficient. Relying on a single several digit number allows too much room for human error. This error can occur when labeling after being drawn or in the lab where all blood specimens look alike. Therefore current CONUS MTF laboratory policy insists upon patient name, SSN, patient registration number, location requesting, tests or procedures requested and doctor requesting. The diagnostic areas are heavy users of bulky consumables i.e., solutions and reagents. Most of these reagents have expiration dates, which must be managed.

Radiology must receive the procedure request, record the request, determine correct resources for the procedure, schedule, and complete the procedure. Unique patient identification data is required for the X-ray film and jackets they will be stored in for transfer with the patient. The X-ray film must show the type procedure (angle) and patient name, number, and date. The same information is required for the CAT scan tapes. The results of the procedure and film are sent to the location required as specified on the procedure request form. The patient and procedure results are logged in/out.

The Main and Stat laboratory will provide a listing of all tests performed, frequency of test, correct form, and specimen collection technique to all physicians, treatment

areas, and Hospital Administration. This list may be modified depending on reagent, supplies, personnel, and equipment resources. The Main and Stat laboratories will record the request in the log with the time, urgency, patient identification, location, and procedure(s). The labs will perform the procedures as required and record the results in the log and on the request. Depending upon the urgency and nature of the test the Main lab may call back the result or file it in the ward mail box. The Stat lab will routinely call back results.

The Blood Bank provides immunohematology, blood and blood component management. It requires the same patient information as the other diagnostic areas. In addition, the SF518, transfusion number, patient blood group and type, donor unit number, major and minor cross match, compatibility results, signature of technician, date, time, and signature of person picking up the blood is recorded in the blood issue log. The blood bank manager requires expected use requirements from Surgery and Hospital Administration to properly manage the MTF scarce blood supply. The blood bank manager must keep the proper mix of packed red blood cells (RBC) and frozen units to give prompt efficient service and prevent waste.

c. Surgery

"3.0 Surgery" consists of the following areas; pre-operation patient and holding, operating rooms, anesthesia workroom, and recovery room. The patient on the way to "3.0

Surgery" will have been decontaminated, admitted, and stabilized on the way through casualty reception or from a ward. The patient's chart or medical record continues to be updated with data regarding treatment, vital signs, medications, doctor's orders and injury condition. All of this information has been recorded on standard medical forms. Surgery will add a few more such as, Operation Report (SF516), Anesthesia Report (SF517), SF518's and more lab requests. The surgeons and the surgical nursing staff schedule the patient on a priority basis. This is based upon rooms available, number of casualties arriving, type of surgical procedure required to treat the injury. Patient identification is essential in the Surgery process for effective care. Following the surgical procedure the patient is sent to the Recovery Room for post operative care and monitoring. Depending on the doctor's evaluation of the patient's condition after recovery the patient may be transported by stretcher to the "4.0 Ward" which can best provide the level of care necessary. Hospital Administration will be notified of the bed requirement and assign the bed. Medical Supply will be notified of any restocking requirements.

d. Wards

The "4.0 Wards" are the primary holding and care location for the patients. A bed will be assigned each patient based on clinical condition and availability by Casualty Reception, or Hospital Administration.

The Ward will be primarily responsible for the patient's location, ward supply room, treatment, maintenance, ward medication locker, medical record (chart), and clinical improvement. The Ward will receive medication in bulk from the Pharmacy and IV's as needed. The Ward must ensure all information is recorded in the medical record. All the standard forms previously mentioned are used or reviewed including Nursing Notes (SF510) and Progress Notes (SF509). The ward must communicate with all areas of the MTF in the process of caring and documenting care for each patient. This communication will be by phone and or standard form. It is anticipated that the patient will move from intensive care to limited care wards depending on clinical condition and need for intensive or acute care beds. If evacuation transport is available the patient may be evacuated at any time after stabilization. The ward will assist Hospital Administration in this evolution by preparing the patient.

e. Medical Supply

The "5.0 Medical Supply" function has been merged with the overall ship Supply Department. Only those functions in direct support to the MTF are depicted in the logical model. Supply functions associated with ship operations are outside the scope of this thesis. Medical Supply is manned by medical and non-medical personnel. These personnel will provide the major source of manpower for transport teams and stretcher bearers. They are responsible for security, accountability,

logistics, and availability of supplies, equipment, and services relating to the AMAL/ADAL, and medical consumables. Operation and staffing of food services and laundry are Supply functions. They will communicate with all areas of the MTF by phone and standard form. The ward must inform the galley of the number of patients and diet required. Medical Supply will stock all satellite storage areas in casualty reception, wards, treatment areas, labs and surgery. Medical Supply will respond to emergent requirements, but will routinely stock storage areas at times of minimal patient traffic. They will keep Hospital Administrative informed of supply status.

f. Hospital Administration

"6.0 Hospital Administration" is responsible for the administrative aspects of patient care, MTF directives, policy, and coordination between the other major processes in the logical model. More specifically they do, disposition, medical regulating (EVAC), clinical records, collect medical statistical data, maintain MTF personnel records, manage the morgue process, monitor patient admissions, interface with the Ship's Master and all MTF outgoing reports.

Hospital Administration is the information hub of the MTF. Hospital Administration is responsible for staffing, training, MTF standard procedures, and management plans. The following essential operation status boards must be maintained and available at all times; Personnel Status, Admissions &

Registration Status, Bed Status, Patient Location, Blood Available, and Spot Status.

The Personnel Status Board consists of;

o Staff Id., e.g., name & rank
o Primary duty station, e.g., Supply
o Berthing space, e.g., port 3-52-2
o Cross training (additional qualifications),
o Watch rotation, e.g., Mids
o Watch station,
o Lifeboat station,
o Status e.g., leave or sick in quarters (SIQ)

The Admissions/Registration Board consists of;

o Patient Id., e.g., name, registration #
o Date of arrival,
o Evacuation status e.g., ready or pending,
o Injury type, e.g., burn, chest wound
o Combat unit, e.g., 2nd MAR DIV

Bed Status (for each) ward consists of;

o Ward name or identification
o Level of care, e.g., limited
o Ward bed capacity, #
o Number of beds occupied, #
o Number of beds available, #

Patient Location consists of;

o Patient Id., e.g., name, registration #
o Ward assigned,
o Current location, e.g., galley
o Evacuation status, e.g., assigned, pending

Current patient location is essential due to MTF size, complexity, and limited manpower. The safety of the patient in case of disaster depends on the location. Also, evacuation resources are expected to be scarce and the patient must be locatable to coordinate debarkation.

Spot Status consists of;

- o Total bed capacity, #
- o Beds occupied, #
- o Number of patients waiting surgery,
- o Surgical backlog in hours,
- o Casualty reception backlog,
- o Total casualties onboard, #
- o Number of casualties by combat unit,
- o Total number of patients requiring evacuation,
- o Number of patients assigned to evacuation,
- o Number waiting evacuation resources

g. Command and Control

The "7.0 Command and Control" bubble relates the following processes; coordinate ship/MTF operations, coordinate and control MTF operations, coordinate ship safety and disaster training, communicate and coordinate evacuation resources, and communication with Task Force, Group or Area Commanders. Many MTF and ship evolutions are a joint effort. Many support functions and services are common to both ship and MTF. Coordinate and Control MTF was discussed under Hospital Administration. Safety and disaster training such as fire, lifeboat drills, etc., are seen as essential for all crew/MTF staff and deserve constant attention. Safety of the all patients and ship's personnel cannot be over stressed. In addition, occupational health and safety, Coast Guard, Naval regulations must be effectively enforced throughout the Hospital Ship.

Communicating and coordinating evacuation resources may include requesting helicopter evacuation resources from the Commander, Amphibious Task Force (CATF) or the Commander,

Landing Force (CLF) by radio (Medical OPORD, 1983). It might also include using satellite communication (SATCOM) to interface with the Defense Medical Systems Support Center (DMSSC) standard systems. This SATCOM interface may be with the Defense Medical Regulating Information System (DMRIS) which connects with the Armed Services Medical Regulating Office (ASMRO) and the Automated Patient Evacuation System (APES) to provide evacuation of patients from overseas via European or Pacific air evacuation squadrons to CONUS MTF's. (DMSSC, 1987)

On the Mercy's first humanitarian mission to the Philippines an ocean-going tug accompanied the Hospital Ship. Due to the size and deep draft of the Hospital Ships many harbors lack adequate channels and ship berthing facilities. Also, pier side logistic support is often inadequate. The Hospital Ships depending on the mission and environment may be accompanied by a varied mix of support ships. This is more likely considering the Mobile Logistic Support Force (MLSF) ships do not normally carry the medical consumables needed by the Hospital Ships. In addition, the Hospital Ship's were designed to use helicopters as the primary patient evacuation vehicle. These resources are expected to be in short supply near a combat theater where the ships are to operate in wartime. An auxiliary supply vessel may do double duty as logistic support and Air Ambulance Detachment Depot. Regardless of the mix of support vessels, which accompany or

replenish the Hospital Ships, coordination is required. (MEDCOM-22, 1988)

3. Existing Information Systems

Installation and implementation of SNAP II with SAMMS and AQCESS are currently planned for both Mercy Class Hospital Ships. SNAP II is the current non-tactical information system in use by the Fleet. Although a site visit by the author to the USNS Comfort berthed in San Diego in early 1988 showed no Harris SNAP II hardware and only SAMMS operational on the Zenith-248's. The Mercy in November 1987 had one Harris configuration operational with part of the SNAP II software, one Harris configuration idle, and SAMMS operational on the microcomputers.

The Hospital Ships have no billets for Information Systems officers, Data Processing Technicians (DP) or Data Systems Technicians (DS). At ROS when maintenance and readiness are essential one Electronics Technician (ET) and five Bio-Medical Repair Technicians will provide preventive maintenance on all medical equipment, communication, and information systems. Both Hospital Ship OIC's indicated the need for information systems implementation assistance. Although, the current ROS crew can learn to operate the planned information systems, more technical experience in maintenance and implementation is required for effective use.

The SNAP II will primarily address information requirements present in the Medical Supply and Hospital

Administration processes depicted in the logical model. SNAP II provides several submodules; System Management Subsystem, Supply and Financial Management Subsystem, Administrative Data Management Subsystem, and the Maintenance Data Subsystem. Appendix F contains more detail regarding the SNAP II subsystems taken from the individual subsystem specifications.

The SNAP II Automated Medical Microcomputer System (SAMMS) was designed for use by independent duty corpsmen and medics. It will support the MTF staff and ships crew health record maintenance, monitoring, and reporting requirements. It supports training, AMAL/ADAL management, and interfaces with SNAP II. It has the following modules; master file handling, medical encounters, radiation health, occupational health and environment surveillance, training management, supplies management, and system maintenance. More SAMMS detail is available in Appendix G. (DMSSC, 1987)

The author learned by telephone that the Military Sealift Command has a similar system called the Shipboard Medical, Inventory and Finance system (MEDIS) which they would like to use on-board the Hospital Ships (NAVMASSO, 1988)

A decision must be reached at higher echelons which systems will be actually implemented. Some overlap of function exists already between SAMMS and SNAP II in the supplies function. The size of the hospital ship AMAL/ADAL would suggest that it belongs on the larger SNAP II system.

This would allow centralized reporting and monitoring of both ship and MTF supply status.

The Automated Quality of Care Evaluation Support System (AQCESS), which is a standard military MTF system, was designed to collect and report clinical, administrative and management information necessary for the inpatient portion of the DOD medical quality assurance program. The basic modules of AQCESS are; Admission and Disposition, Clinical Records, Quality Assurance and Ad Hoc reporting. AQCESS can support an automatic card embosser interface. Several companies manufacture embossing machines of various types which will interface. Appendix H contains more details about the AQCESS modules. (DMMSC, 1987)

AQCESS has the capability to switch to a reduced input admission screen more suited for mass casualty use, than the normal admission/registration input screen. This capability speeds patient admission by reducing the data items required for admission. This capability is not well documented. But it's existence is indicated in the AQCESS implementation manual. (AQCESS Implementation Manual, 1985)

AQCESS is standard throughout all DOD MTF's around the world. Although some MTF's have added newer modules for outpatient reporting, collection agent, and eligibility verification. The Mercy class MTF only requires the basic inpatient modules to meet its primary mission.

Recently, while this thesis was in the last stages of completion a conversation with OP-933F, the point of contact for information systems support for OP-93, the Navy Surgeon General, indicated that a new DOD information system called Joint Theater Medical Information System (JTMIS) was planned for the Hospital Ships. The specifications for JTMIS did not arrive in time to be included in this thesis. However, it appears that JTMIS will not be available until the mid-1990's. It seems that waiting for this future system to address the Mercy Class information requirements is not in keeping with the readiness posture which drove the development of the new Hospital Ships. Therefore, it was not considered in this thesis.

4. Summary of Fulfilled Information Requirements

The following discussion assumes all modules of SNAP II and AQCESS are successfully implemented. SNAP II being an operational fleet information system with bar code reading capability, which readily addresses medical consumables and (AMAL/ADAL) inventory control, resupply, supply history, preventive maintenance and repair, and utilization of supply item.

SNAP II and SAMMS address all major MTF supply information requirements, except how much to take the first time on differing missions into uncertain environments. SAMMS and SNAP II provide much of the administrative information processing required in the hospital administration function.

Cross training which was identified in the OPDEMO as a problem can be adequately monitored once the training requirements are determined. Disaster, fire and lifeboat training can be tracked for each staff and crew member.

SAMMS addresses health record, occupational health and safety information. Personnel records processing, alpha rosters, watch bills, berthing rosters and lifeboat musters are supported by SNAP II.

AQCESS addresses most of the medical status boards in Hospital Administration. AQCESS generates standard admission and disposition forms. It does not address the other standard forms mentioned in the discussion of the logical model or support evacuation. But, most of all AQCESS provides a method of ensuring the standards of health care are met, which is a professional, social, morale and political necessity. (AQCESS User's Manual, 1985)

5. Recommendations

- The Hospital Ship logical model can assist in the development of management plans and procedures.
- The Mercy Class ships require more IS implementation and maintenance assistance.
- One organizational entity with adequate IS resources should be made responsible for Hospital Ship IS development and support. Dividing ship responsibility for IS support complicates and duplicates effort unnecessarily. A clear line of control and assistance is required for efficient management.

C. INFORMATION SYSTEM DEFICIENCIES & NEED

The standards of medical care have changed since the days of the last operational hospital ship USS Sanctuary. Lessons

about stress where learned from the Sanctuary (Shea, 1982) and just how much could be done with so little. The culture of the all volunteer military service has changed also. Medical costs have increased. Public awareness has increased. Political and public pressure have increased. All these changes put pressure on the old manual methods, demand higher efficiency and increased accountability.

1. Discussion

The reality is that the SNAP II system is not fully implemented due the recent introduction of the hospital ships, inadequate manpower with the required specialized skills, and concentration in other areas of ship preparedness. AQCESS was written in the MUMPS programming language and operates on Digital Equipment (DEC) hardware. The MUMPS compiler on the DEC will not work correctly on Harris hardware. Therefore AQCESS will not presently function on the Mercy class Harris SNAP II hardware. Since medical readiness was a primary purpose for the new Mercy class ships only two options are viable; write a new MUMPS compiler for the Harris hardware or replace the Harris with DEC hardware.

There are advantages and disadvantages to both options. Writing a new compiler is a software development project which is time intensive, expensive, and usually encumbered by delays. The second option appears far easier, since it provides a ready made and working system. However, the DEC must be tested for shipboard use and purchased. New training for maintenance

personnel would be required. A new and different set of spare parts and possibly redundant hardware would be required. Future communication between the SNAP II hardware and AQCESS may be compromised. Also, current standard system restrictions may apply.

Even with SNAP II and AQCESS, operational functional deficiencies still exist (based on conversation with ROS MTF staff, and comparison of the logical model with the details of the existing information systems SNAP II, SAMMS and AQCESS presented in this thesis).

- o The initial keyboard data capture method of AQCESS is time intensive and information can not enter the system at the source of information, the casualty. Patient information must be written on work sheets, be carried to the terminal and then entered into the system. (AQCESS User's Manual, 1985)
- o No centralized patient tracking information is available.
- o No patient evacuation or evacuation resource information is available.
- o No surgery status is available.
- o Most of the information required for the status boards is available from AQCESS and SNAP II but it must be collected from different video display screens and reports.
- o Handwritten status boards are slow cumbersome tasks.
- o The OPDEMO finds that general communication is inadequate and ineffective throughout the MTF.

2. Alternative Methods of Data Capture

Casualty Reception could use speech recognition technology discussed in Chapter Two. This would permit rapid registration of casualties. The admitting/registration

person(s) could wear headsets with a wireless noise reducing microphone to minimize ambient noise and free the hands for assisting patients. These headsets can be connected to a discrete dependent type (Chapter Two) of speech system by FM receivers. Two general locations should be considered for the roving registrars. One would be on the ramp from the helicopter deck (accessway if boat). This person could not only register patients but assist the ambulatory and provide directions. The other should be in the casualty reception compartment. This person's hands would be free to assist in triage and patient movement, while registering patients. If the unit names are known in advance they could be keyed to a single word speeding entry. The voice recognition system could by trained for each admitting clerk as part of initial training in the admitting function. The process does not require medical personnel. Two drawbacks exist: the ambient noise level may be too high, and the stress of the situation may change the voice pattern of the person admitting.

If noise and stress prohibit the use of voice recognition, then a digitizing tablet could be used. This could also be trained to the specific admissions clerk. The digitizing tablet would restrict movement. This could be minimized by pre-wiring plug connectors at various optimal locations on the ramp and in casualty reception.

As recommended in the OPDEMO report, facsimile transmission (FAX) units should be installed in many key areas

such as, Stat lab, Pharmacy, OR, Recovery/ICU, Casualty Receiving, Supply, etc. This technology is readily available, and can use telephone lines for transmissions. This increased line requirement should be considered in all the areas already identified in the OPDEMO. These FAX units should have automatic sheet feeders and collection bins. The paper used should not be the heat sensitive type. Heat sensitive paper is harder to stock, use, and store. As discussed in Chapter Two consideration should be given to purchasing FAX that will interface with a personal computer for future increased capabilities.

3. Alternative Method of Patient Tracking

The patient once registered in the AQCESS system will have an admitting form created and an embossed card with patient identification. This card will allow rapid stamping of standard forms for the patient's chart. This card could have a magnetic strip (like a credit card) on the back with this same information. This is an optional attachment on some card embossers. Each treatment area or ward could run this through a reader and provide a central data base the current location of each patient. These readers are the same type used in department and grocery stores to record credit card numbers and they work over the telephone lines. This line could be connected to a microcomputer in hospital administration, which could automatically track all patients.

The patient tracking could be extended to the Wards and diagnostic areas by the use of a Local Area Network (LAN) and personnel computers. Then the magnetic card could be used to update procedure and ward logs. A LAN could also provide word processing and message generating support to areas with few administrative personnel.

When a new Dog Tag is available, e.g., microchip encapsulated "Data Tags" under study by the Army and Navy discussed in Reports No. 84-15, 84-40, and 84-41, are available only the tag readers need be changed.

4. Alternative Method of Data Display

It is not enough to merely collect the data. Current information must be readily available for effective management use. The Ad Hoc generator on AQCESS can be used to create custom displays of required information such as, number of patients admitted and number of patients on each ward. This information is required for proper bed management. This should be displayed for all to see. Therefore a large, flat gas-plasma display screen could be attached to a conspicuous bulkhead in hospital administration and casualty receiving. These screens are currently being tested for use as aircraft carrier's status boards and provide better resolution than overhead projectors.

5. Recommendations

- Facsimile Transmission units should be installed in all key areas which utilize forms on a rapid and frequent basis.

- o Large flat gas plasma display screens should be connected to the current systems to speed the effective use of collected information.
- o A Voice recognition system should be tested for suitability in the casualty reception compartment.
- o The logical model should be expanded and used in the design of future Mercy Class MTF information systems.
- o The embossed magnetic strip card for patient identification can be utilized as soon as AQCESS is installed. Patient tracking software can be developed locally or purchased for a small fee.

D. HOSPITAL SHIP TRANSITION MANAGEMENT

In Chapter Two the transition process was identified as changing from the present state of readiness to the required future state of readiness as illustrated in Figure 3-2.

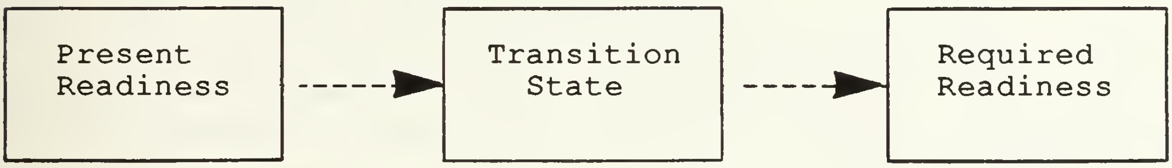


Figure 3-2 Transition Process

The transition state should be the execution of a previously developed plan. A method of preplanning for this transition was proposed which used the following seven phases, (Beckhard & Harris, 1987):

1. Determine the "core mission" of the organization.
2. Outline the demand system.
3. Outline the current response system.
4. Project the probable future demand system.

5. Identify the desired state.

6. List the activities necessary to achieve the desired state.

7. Define cost-effective options.

Phases One through Three deal primarily with the determination of the present state. Phases four and five attempt to deal with the required future state. Phases six and seven outline the transition state.

1. Discussion

The list of major requirements and capabilities coupled with the stated primary and secondary mission could be summarized as "...we want a mobile 1,000 bed modern acute trauma hospital with which we might do almost anything." Each mission requires a different transition plan, four broad separate and distinct missions can be identified from the literature reviewed:

- o Primary mission
- o Humanitarian mission (secondary)
- o Training
- o Ship at FOS, MTF at ROS

Missions one through three can be further subdivided. For example, the primary mission could be as an ambulance ship or amphibious assault medical support, etc. The secondary could be post disaster medical support or a world tour with either all navy staff, part civilian or tri-service.

Regardless of how many different recognized missions, each requires a unique transition plan. With only days to change from ROS to FOS there will be little time to plan. Planning must be done in advance of transition. Information taken from simulated war gaming research at the Naval War College regarding threat scenarios, and the Hospital Ship's relationship to fleet operations, would be beneficial in identifying different mission environments.

The following sections will assist in analyzing the present, transition, and future (required) states. The procedure identified below will also assist in determining if the future state is different enough to require its own unique transition plan.

a. Present State of Readiness

First determine what core mission the hospital ship MTF is prepared to carry out. Step two, create a demand list for the MTF. This is a list of all the groups, agencies, internal activities and other organizations which are making demands, or want something from the MTF. Then to this demand list add all the things they want. Simply fill in the sentence, "They want us to...!" for each group that is making demands.

Next, adjacent to the demand indicate how the MTF is responding to these demands. A response may be to ignore, to wait, to respond partially, or to be actively involved, e.g., allocate resources, train, and/or create plans. This

list will also help continuity of management during and after change of command. Then based on the type of response create another list of assets and resources assigned to the demand list created above.

b. Required State of Readiness

Probably the most difficult thing to do is forecast the demands, the "they want..." of the projected state. Knowledge of the expected operational environment and experience in operating in that environment is essential. The "they wants" should be listed as before, but titled projected requirements.

Now estimate the resources required to satisfy the list of projected requirements just created. These resources should be listed in common units of measure to allow comparison with the previous lists. Do not consider availability at this time, it would only distract, simply list the requirements. After the lists are complete compare them with the lists created in the present state analysis. Remember to add any resources in inventory, but not previously allocated in the present state analysis. A deficit or shortfall list can be created from this comparison.

c. Transition State

The resources on this deficit list will be some of the objectives of the transition state. This list may include people, skills, information, technology, and supplies. Now

identify the activities required to acquire the resources identified on the deficit list.

2. Transition Plan

A transition or change plan should be created which incorporates the deficit list and the activities just identified for each future state. The execution of this plan will require resources, strategy and a manager. The transition plan will need to be relevant, specific, chronologic, integrated and adaptable in pursuit of the desired state. The ROS crews will be the primary transition teams for the MTF and hospital ship. The MTF ROS crew has had the time to become an organized, integrated unit and develop a working relationship. The following discussion only addresses the primary Mercy Class mission area.

Current policy indicates that the OIC of the ROS MTF crew will become the XO of the FOS MTF crew. The General Information Manual of the Hospital Ship does not indicate what position the ROS Administrative Officer (AO) will hold in the FOS crew. Looking at Appendix I it seems logical that the ROS AO would become the FOS Director of Administration. That would allow the current working relationship to flow into the new FOS organization.

A manager is needed to execute the transition plan. The logical choice for this temporary position is the ROS MTF AO. The AO will execute the transition plan with the ROS staff. The OIC/XO will be occupied orienting the newly arrived

designated FOS CO. It is possible that a Group or Task Force Commander will be assigned to the hospital ship due to the tremendous need for safety and requirement for Fleet coordination. It is also likely that other support ships may accompany the hospital ship or be assigned to the medical mission. It is essential that a working relationship exist as soon as possible between the Master of the ship, OIC/XO, new MTF CO and the potential Group Commander.

Recalling Chapter Two, a transition strategy is needed. The technical, political and cultural organizational subsystems of the new FOS MTF organization must be aligned with the required state. The required change agents are listed in Chapter Two for all three subsystems. The alignment process can begin in transition state for the political subsystem. Technical and cultural subsystem alignment must begin before the FOS MTF staff reports during transition. The cultural subsystem is the most robust but it is the slowest to develop. The technical alignment may require extensive training which should begin before transition.

An organizational culture has had time to develop within the ROS crew. The ROS crew should not change until after transition. The ROS crew are the change agents and need to remain a unit. Although OPNAV wants the Hospital Ship to deploy within five days of notification, that does not necessarily limit the MTF to a five day transition phase. Termination of the transition phase should be a decision made

by the senior officers involved based on the operational status of the various departments and the time required to transit to the ship's operating station. The transition phase should be terminated by a command ceremony which marks the occasion and introduces the new CO. This will assist both cultural and political alignment of the MTF.

To assist cultural development and readiness, all specialized personnel should be identified and assigned for both ships for each unique mission. A few alternates should also be chosen in critical specialties. These individuals should be provided with the specific ship information manuals, diagrams, duty assignment, position, policies, directives and management plans as they become available. The policies, directives and standard operating procedures should be the same for both ships. This will reduce the impact of coast to coast personnel transfer.

The current duty station should create Temporary Duty Orders and hold them ready for the designated personnel. This will also prevent the current duty station from assigning the already appointed personnel to other deployable teams, e.g., Mobile Medical Augmentation Teams (MMART). Periodic group meeting and training should be held at the current duty station. These designated hospital ship MTF personnel will become a subculture within their present organizational culture.

To adjust the technical subsystem, the assigned personnel should be informed in detail about the equipment in their area of responsibility. Training should be arranged as necessary with standard periodic reports to the controlling director. If possible, an on site visit should be arranged to familiarize the designated FOS personnel with their new environment. This could be done as part of required fire fighting, or lifeboat training. The same equipment should be used on both ships, to minimize the impact of coast to coast transfer, and to reduce potential logistic and supply problems, e.g., repair parts and bulk reagent solutions.

3. <u>Information Systems Implication</u>

Well designed and developed information systems make good learning tools. They provide a structured approach to learning a new job. The documentation provided for the system will also speed learning a new function. This makes it easier for the personnel to relate how they did do it to the change. They also provide a common bond between functional relationships. The review and signature chain that required reports must take, provides good political adjustment.

The information systems should be the same for both ships for the previously stated reasons. This should allow the same automation policy, procedures and directives. Current standard information systems such as AQCESS should be used. Most tri-service medical personnel are familiar with their functional aspects of this system. The SNAP II system will

provide the same familiar support for the non-medical crew. New systems will of course be forth coming for the ships in a few years, but readiness **now** is what counts.

4. Recommendations

- A transition plan for each different type of mission should be developed. This could be accomplished by incorporating the specific change activities listed in Chapter Two and method presented above.

- War gaming research at the Naval War College could assist in analyzing complex operational issues, provide a framework for training exercises, and help isolate the different mission types.

- Future management plans should indicate that the ROS AO become the transition manager during the transition to FOS or anyother operating status.

- AQCESS should be installed on the Mercy Class ships as soon as possible. This will speed FOS transition and bring the MTF to a readiness level similar to CONUS MTF's.

- The logical model would be an excellent orientation tool. It could be adapted to the information manual and the compartment number added to the process bubble.

IV. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. GENERAL SUMMARY

In Chapter One several questions were developed about the Mercy Class Hospital Ship. But prior to answering these questions a foundation of information and management theory was required to support the findings. Chapter Two assisted in this process by presenting organizational change theory, new information systems (IS) tools, IS implementation theory, and transition management theory.

Chapter Three presented the Mercy Class Hospital Ship logical model, the MTF's information requirements, and deficiencies based on the successful future implementation of SNAP II and AQCESS standard systems. Alternative methods for reducing these deficiencies included off-the-shelf systems, such as; embossed magnetic strip card encoded with patient identification for rapid form handling, large gas-plasma display screens, and voice recognition to speed the initial entry of patient identification.

Recommendations for action included increased IS support to the Reduced Operating Status (ROS) crew, consolidation of information system support, and others. A method for creating transition plans to ease the change from ROS to Full Operating Status (FOS) or any other operational status was identified.

Together Chapters Two and Three provide the background for the development of Hospital Ship management plans, transition

plans, implementation of standard IS, basis for new and alterations to current standard IS.

B. RECOMMENDATIONS

After the comparison of the logical model with the capabilities of planned existing standard IS, support for the evacuation process was found conspicuously absent. Further study is recommended for IS support to the evacuation process. Neither of the two planned IS adequately address evacuation. It is important to evacuate all patients clinically eligible as soon as possible to make room for new arrivals. Presently the stubby pencil is the only tracking method. Once the information regarding evacuation status is available then the evacuation process can be optimized. A system which can identify the best evacuation craft for the current casualty mix is required. For example, this system could contain information about the load and lift capabilities of all evacuation resources. This support could be in the form of a Decision Support System (DSS) with an Expert System (ES) containing load and lift capacities of various helicopters, e.g., maximum load for CH-53D, 51 ambulatory or 24 litter patients. This type of system could provide the most efficient load mix of casualties based on current requirements and type of craft. It could be linked by Satellite to other Defense Medical Systems Support Center (DMSSC) systems. Further study and evaluation is required.

The multi-mission requirement, unknown fleet operational relationships and varied operational environments makes transition and contingency planning very complex. Further study is required regarding fleet operations and environments. War gaming simulation at the Naval War College could be used to study the Mercy Class Hospital Ship's relationship to fleet operations and different threat scenarios. This information could be used in the formulation of management, transition plans, directives, policies and operational orders. Training with fleet units is required to test these policies, directives and operational methods.

C. **CONCLUSIONS**

This thesis undertook the development of the Hospital Ship MTF logical model and essential information requirements. These items are presented in Chapter Three. The logical model can assist the Mercy Class MTF managers in developing management plans, policies and directives which are common to both Hospital Ships and provide the background for future information systems. Several alternative data capture and display methods were proposed, which if implemented will eliminate many of the Hospital Ship's present information deficiencies.

During the process of collecting background material for this thesis the lack of robust transition plans became apparent, therefore a method for the study and development of

these plans was also presented. This method is expected to save many hours of planning by providing a step by step process which is specific to the individual mission.

APPENDIX A

SHIP INBOARD PROFILE

Description: The inboard profile provides the physical layout of the ship. It will provide the reader a physical relationship of the areas or compartments as the information requirements and information flows are discussed throughout the thesis.

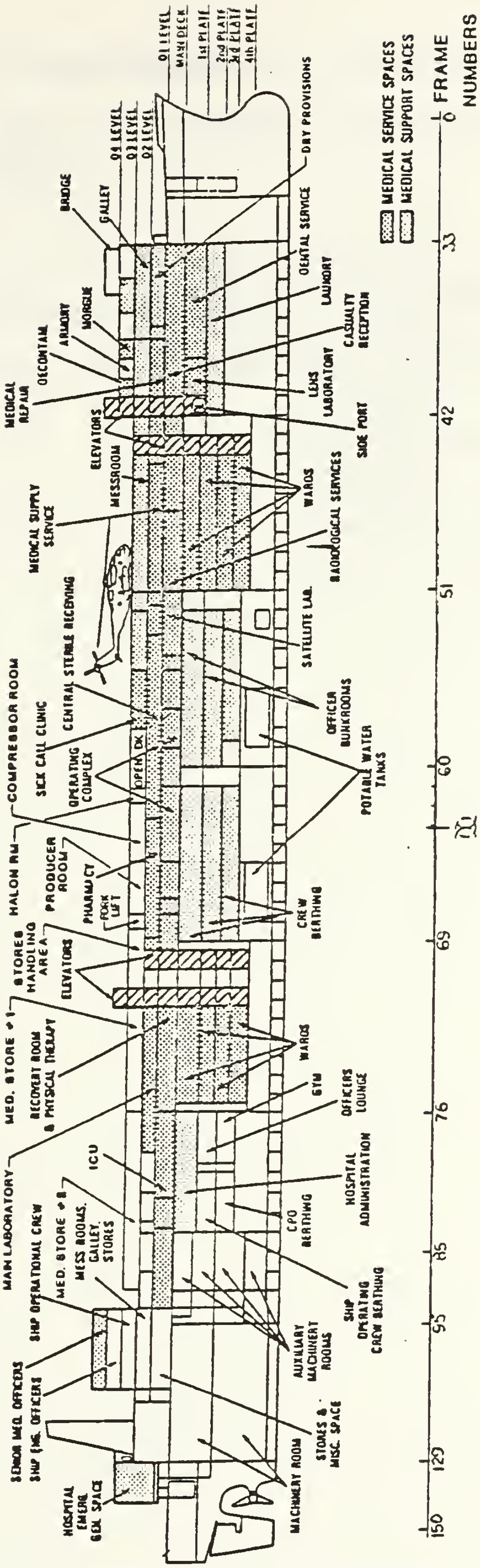


Figure A-1 Ship Inboard Profile

APPENDIX B

MEDICAL TREATMENT FACILITY STAFFING

Description: This provides a more accurate breakdown of the manpower relationship between departments in FOS and ROS. It also indicates the manpower increase at FOS which must report during transition.

MEDICAL TREATMENT FACILITY STAFFING

Full Operating Status (FOS)

Commanding Officer, MTF - 1

Executive Department
- Officers - 2
- Enlisted - 51
- Subtotal 53

Hospital Department
- Officers - 256
- Enlisted - 575
- Subtotal 831

MTF Support Department
- Officers - 4
- Enlisted - 30
- Subtotal 34

Supply Department
- Officers - 7
- Enlisted - 237
- Subtotal 244

TOTAL (FOS Staff) - 1162
(includes ROS)

Reduced Operating Status (ROS)

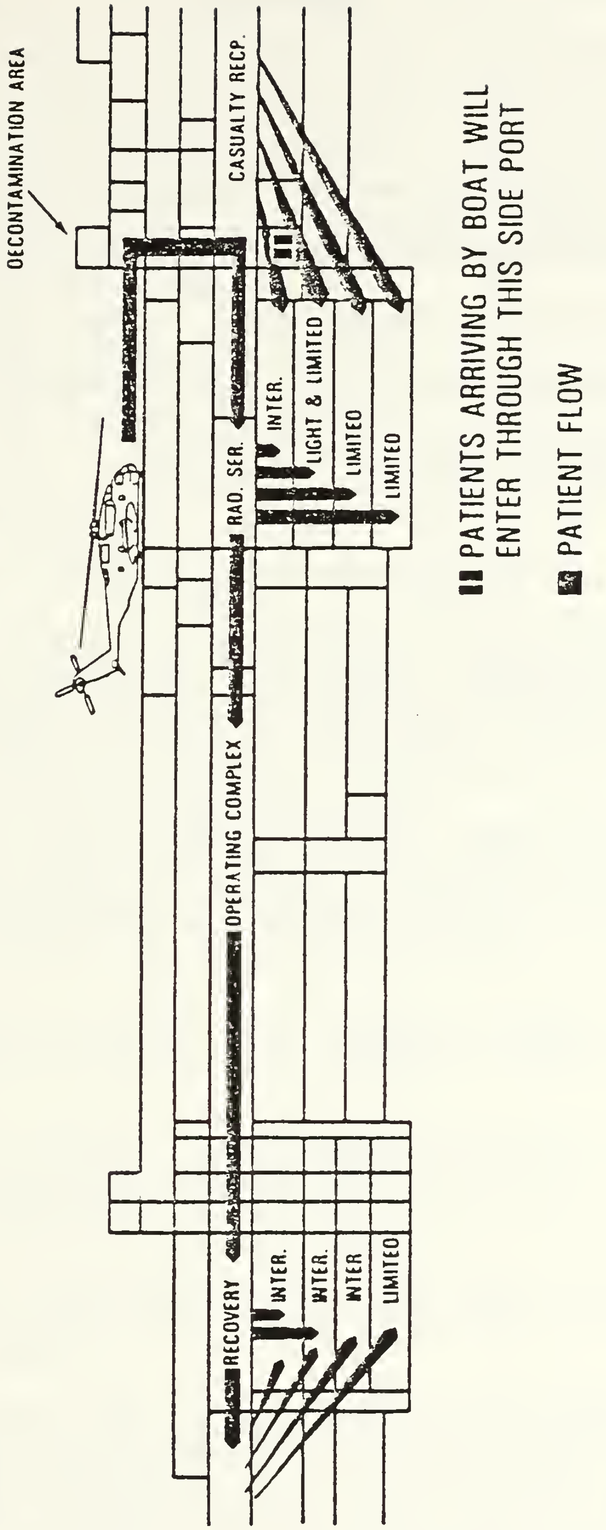
Officer-In-Charge, MTF - 1
- Officers - 5
- Subtotal 6
- Enlisted:
- Medical - 22
- Non-Medical - 12
- Subtotal 34

Total 40

APPENDIX C

PATIENT FLOW DIAGRAM

Description: This diagram provides the reader with the planned patient flow, which benefits the understanding of the logical model. The initial patient flow of casualties drives the information flow. Note the great demand for vertical movement.



C-1 Patient Flow Diagram

APPENDIX D

SYNOPSIS OF MTF CAPABILITY AND EQUIPMENT

Description: This information together with the other physical attributes of the Hospital Ship previously presented, completes the physical view of the platform. This information has been provided in bullet fashion to assist reader reference, while reading the logical model narrative.

SYNOPSIS OF MTF CAPABILITY AND EQUIPMENT

- There are about 1162 military in the FOS crew consisting of medical and non-medical personnel. Due to their recent commissioning and operational status the actual crew size and optimal special skill mix to accomplish the multi-mission requirement is not yet firmly established. The OPDEMO indicates that considerable cross-training will be required in most departmental areas.

- 72 civilian operational crew members.

- Two on-board O_2N_2 generating plants.

- A potable water generating system, and four water distillation plants.

- Decontamination and patient handling areas.

- Casualty reception compartment contains fifty treatment positions for emergency treatment, resuscitation, minor surgery and triage. Each position has piped O_2 and suction, portable surgical lights, electrical outlets, portable suction, and access to portable cardiac monitors.

- Radiology has four shielded X-ray examination rooms and three darkrooms with two automatic film processors and one manual film processor. A computer assisted axial tomography (CAT) scanner suite is installed adjacent to the radiology exam rooms.

- Twelve operating rooms with modern features service the hospital with a six patient holding area and anesthesia workroom.

- Recovery room contains 20 wheeled stretcher beds each with piped oxygen, suction and central monitoring for EKG, pulse, temperature, and blood pressure.

- The intensive care unit (ICU) contains 80 stretcher bed positions. For constant supervision each is as capable as the recovery room.

- The remaining 900 beds are provided in wards that contain single and double high berths. These wards provide a reduced level of care when compared to the ICU. Each contains treatment rooms, nursing station and a ward supply room.

- One main laboratory and one stat lab are provided.

- A blood bank with 3,000 units of frozen blood, pharmacy, and physical therapy are provided.
- Dental services are provided by four treatment rooms, two dental operating rooms, and two X-ray areas.
- Medical repair, food services, laundry, barber and a ship's store are provided.

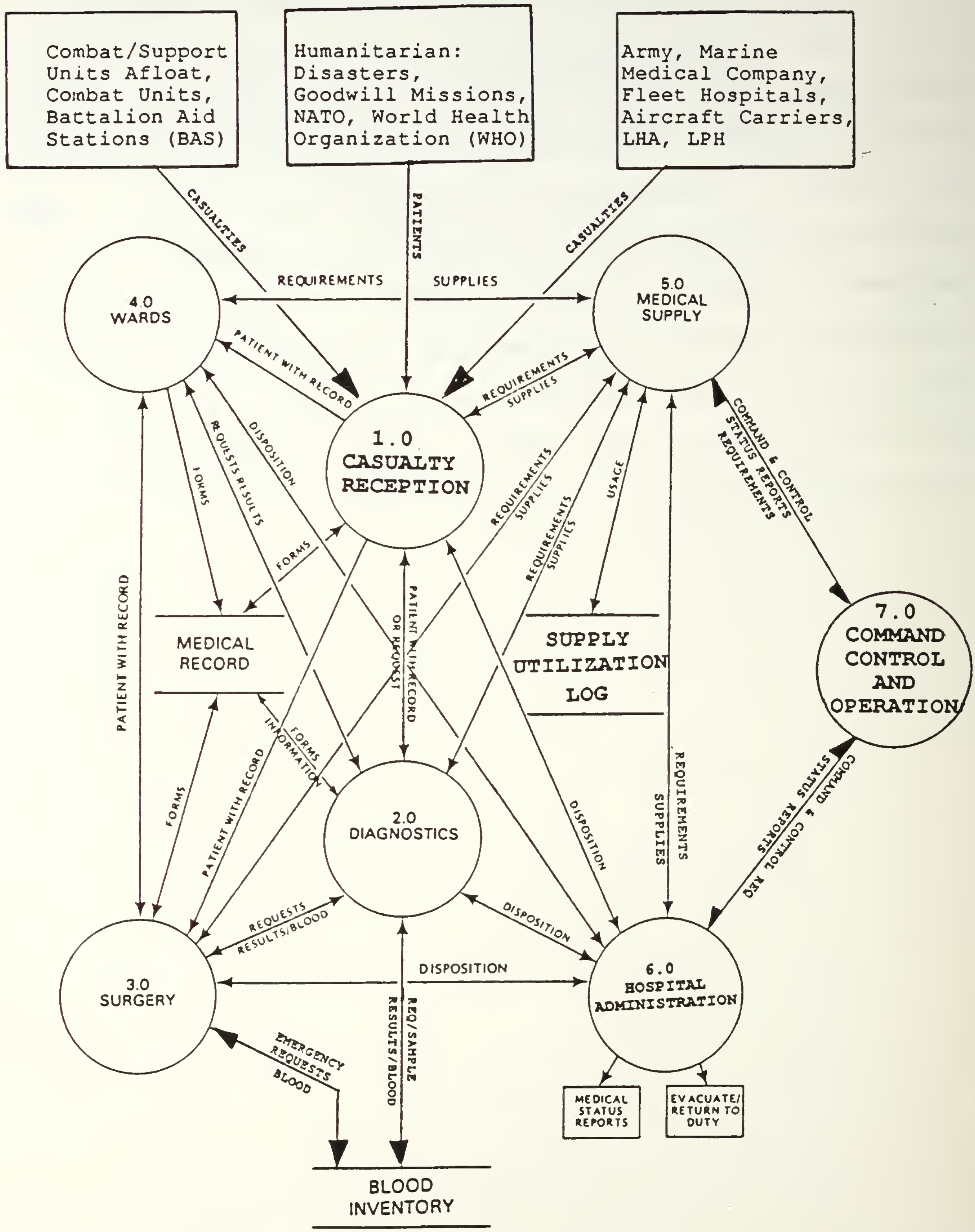
APPENDIX E

HOSPITAL SHIP MTF LOGICAL MODEL

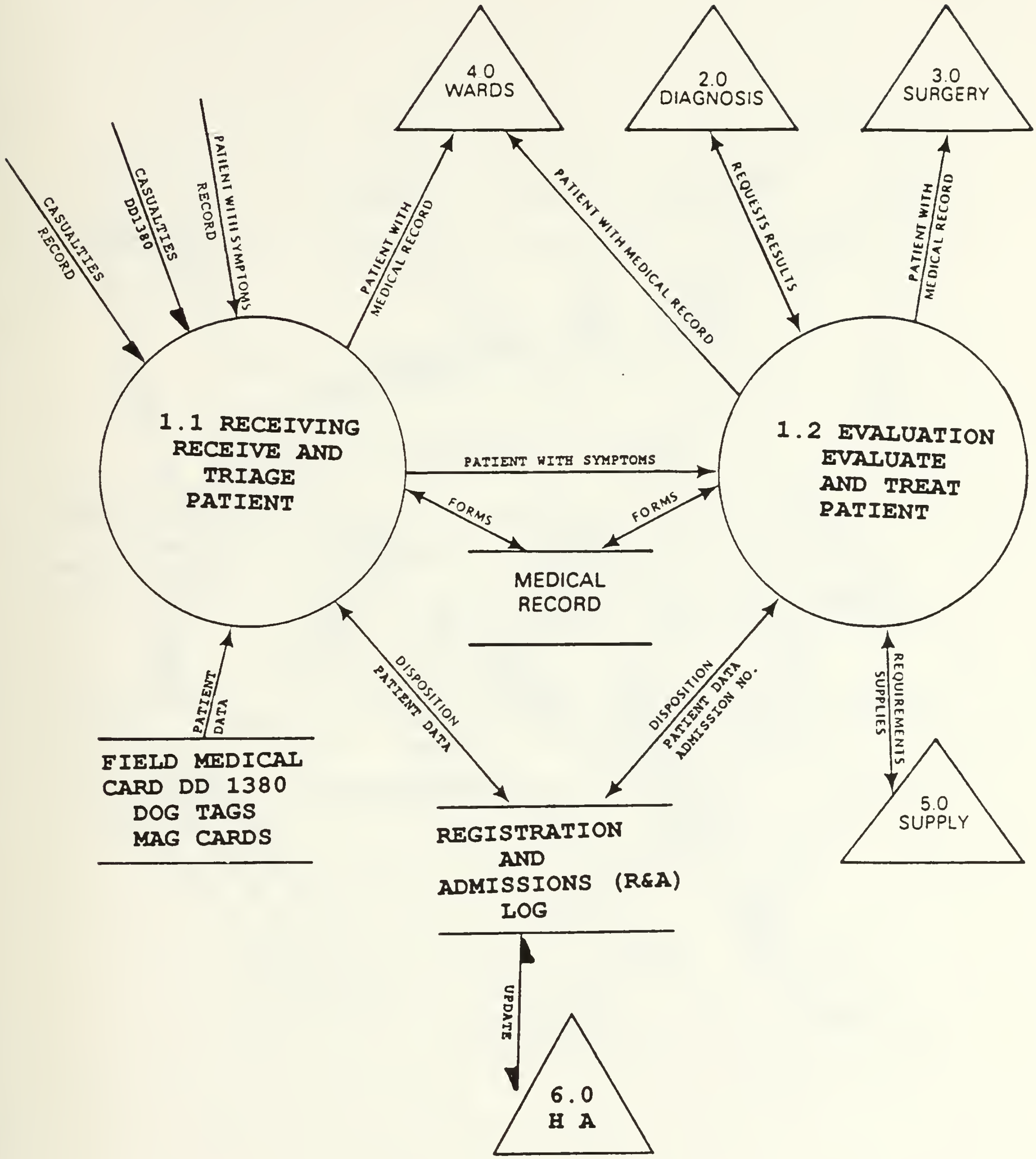
Description: The logical model is a conceptualization of the Hospital Ship MTF. The creation of the logical model provides the reader a communication and comparison vehicle. The information and processes it represents can be used to create management plans, future general information system requirements, speed staff orientation, and identify information deficiencies. The narrative which follows the model is provided to assist the reader's understanding of how to interpret the model.

HOSPITAL SHIP LOGICAL MODEL

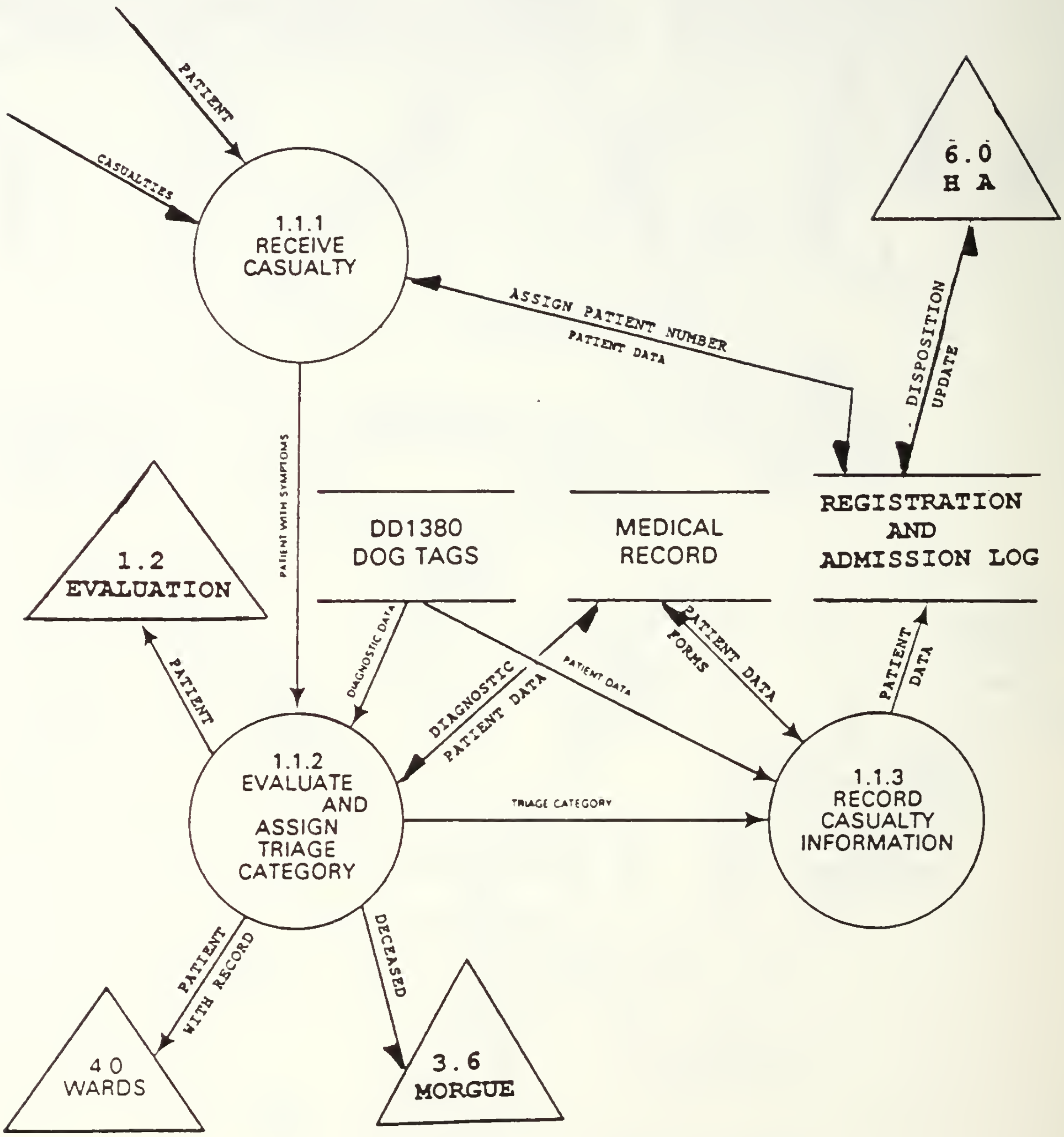
0.0 MEDICAL TREATMENT FACILITY



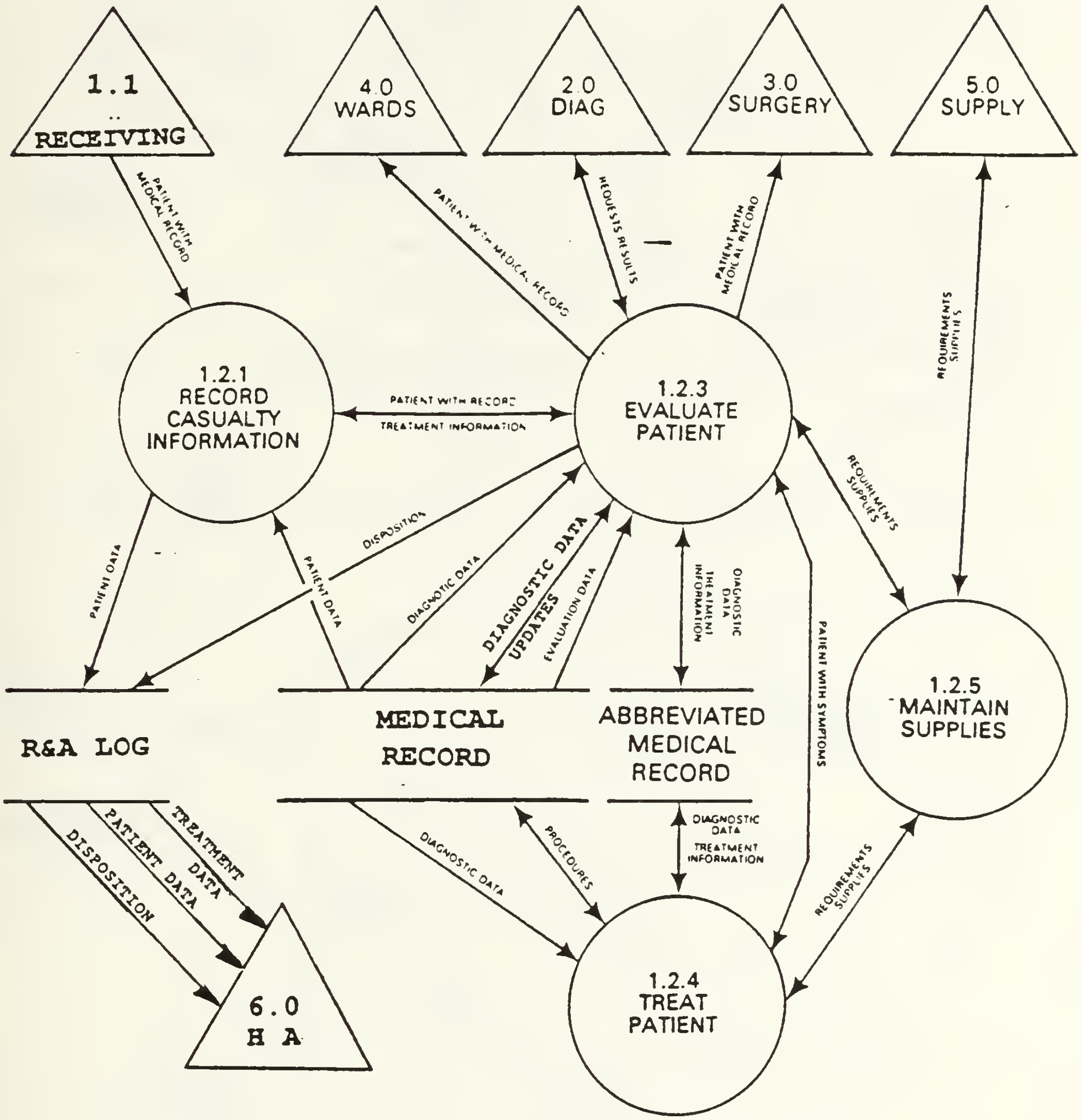
1.0 CASUALTY RECEPTION (C & R)



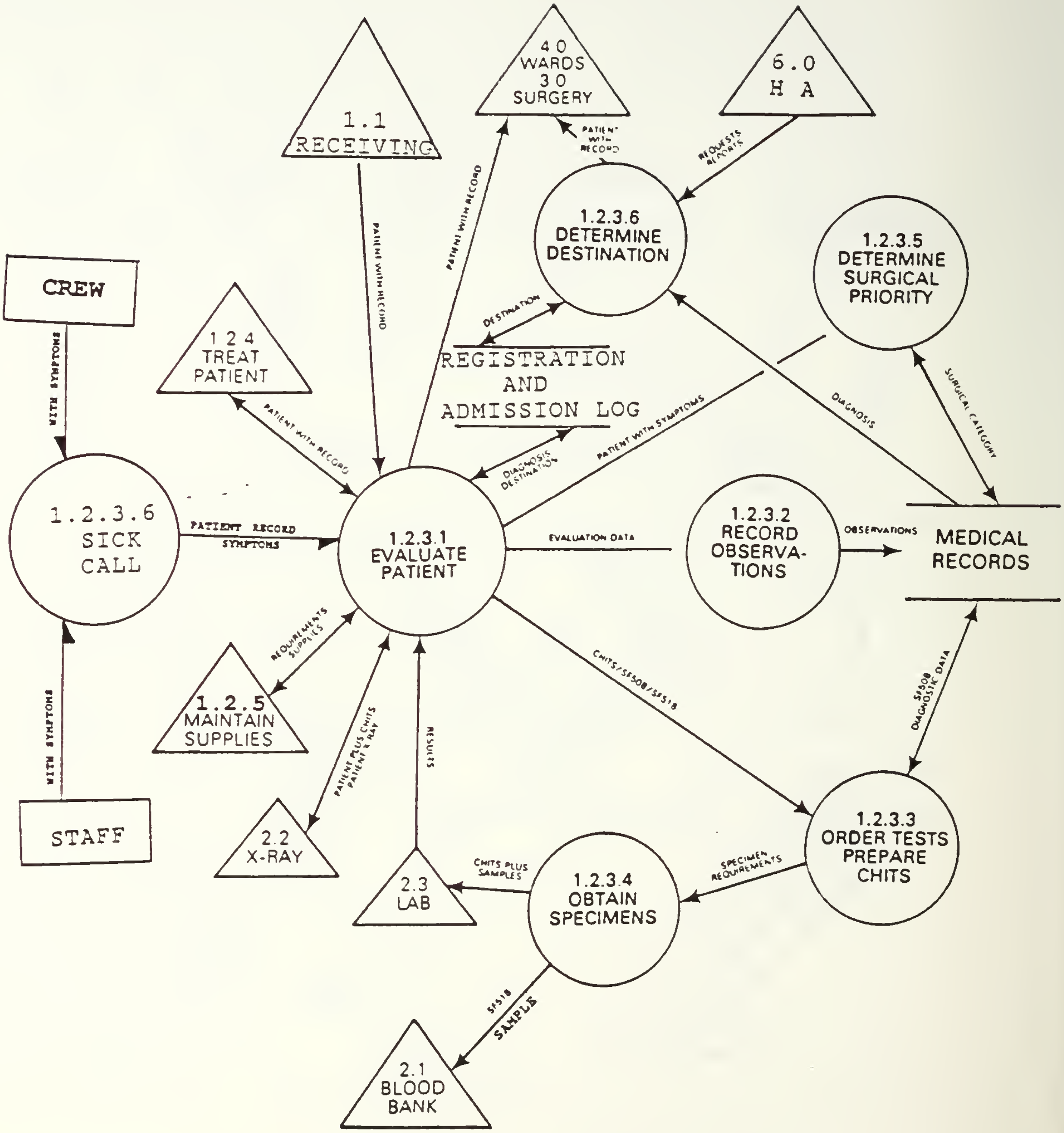
1.1 RECEIVING



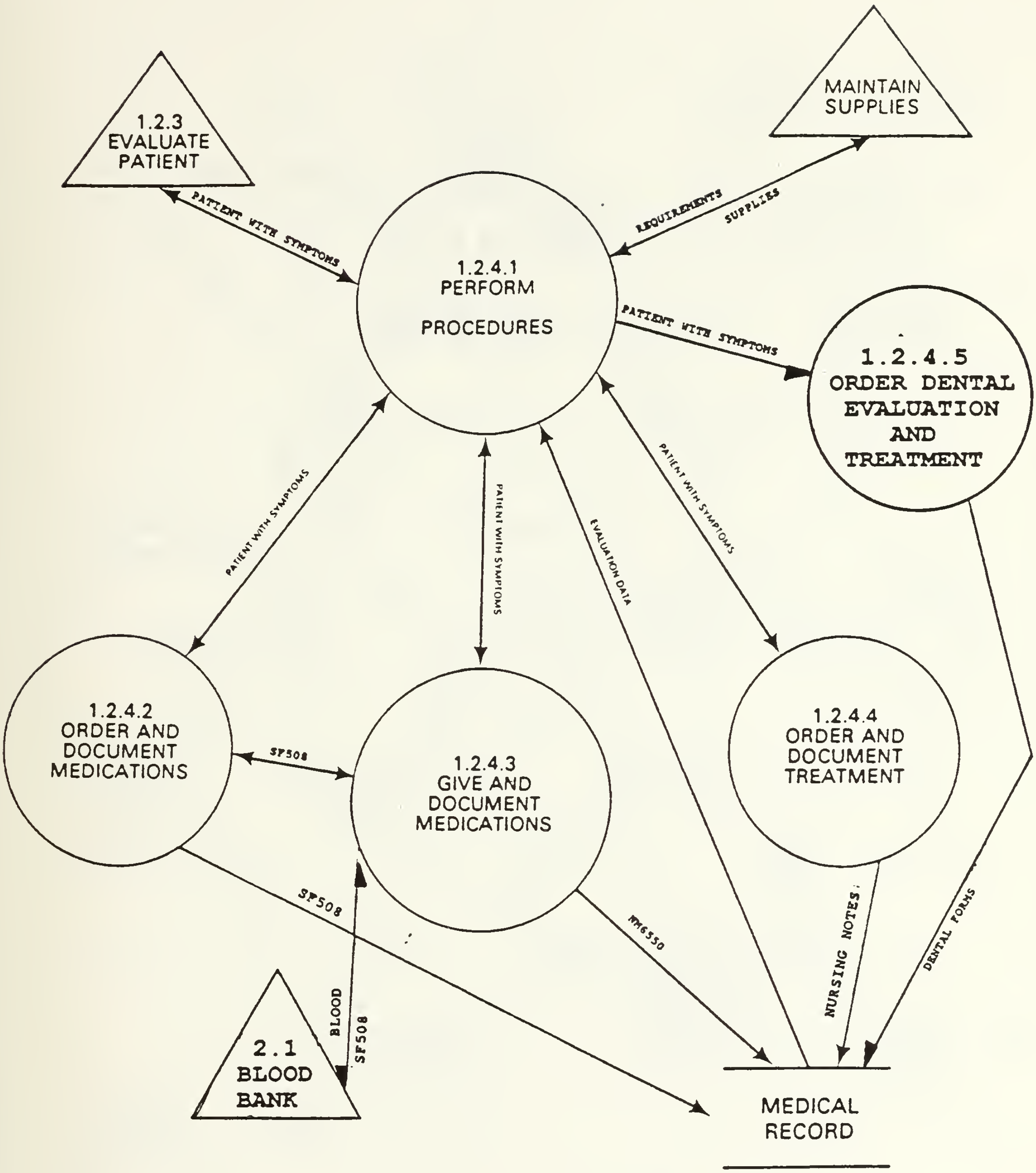
1.2 EVALUATION



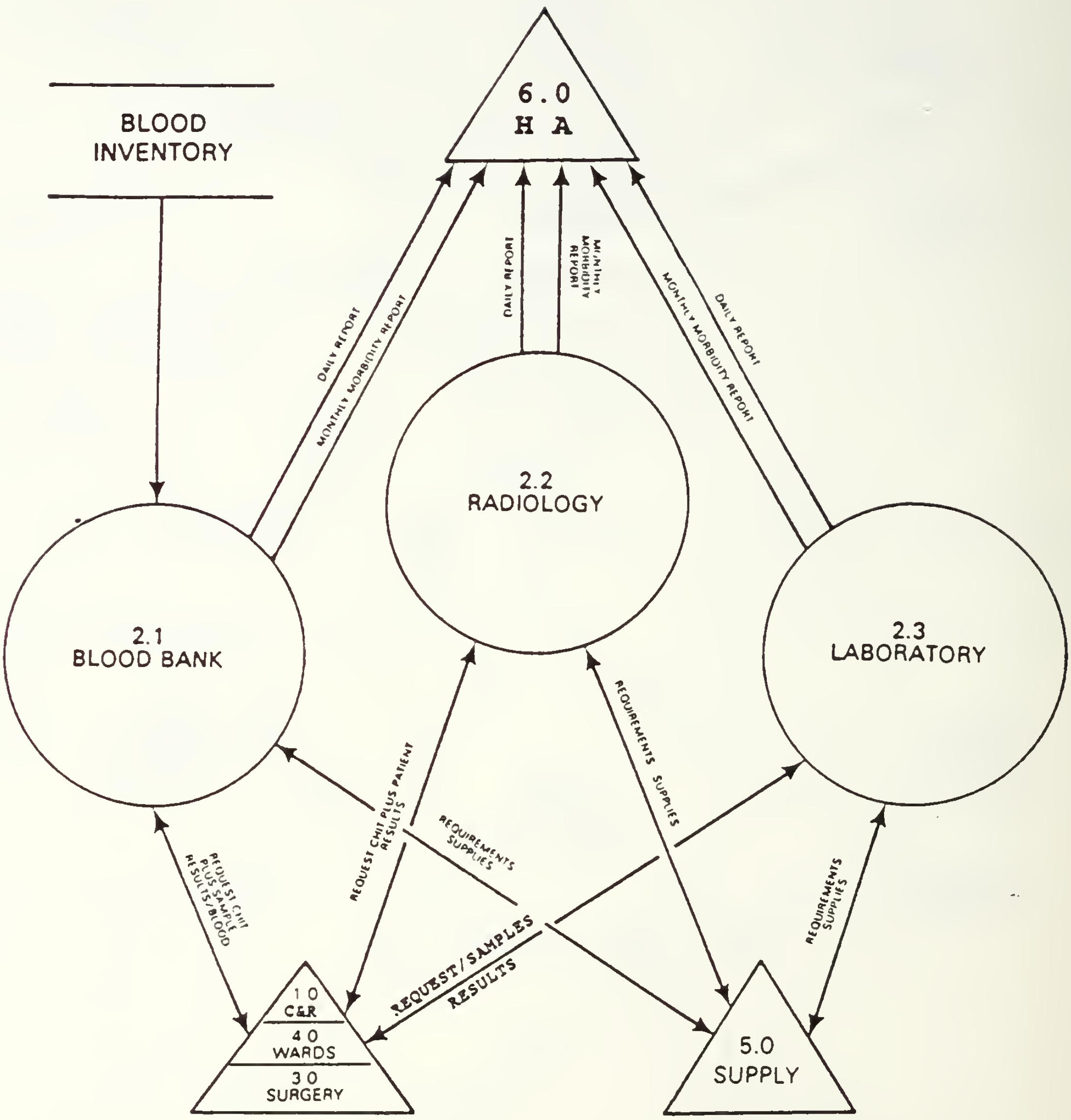
1.2.3 EVALUATE PATIENT



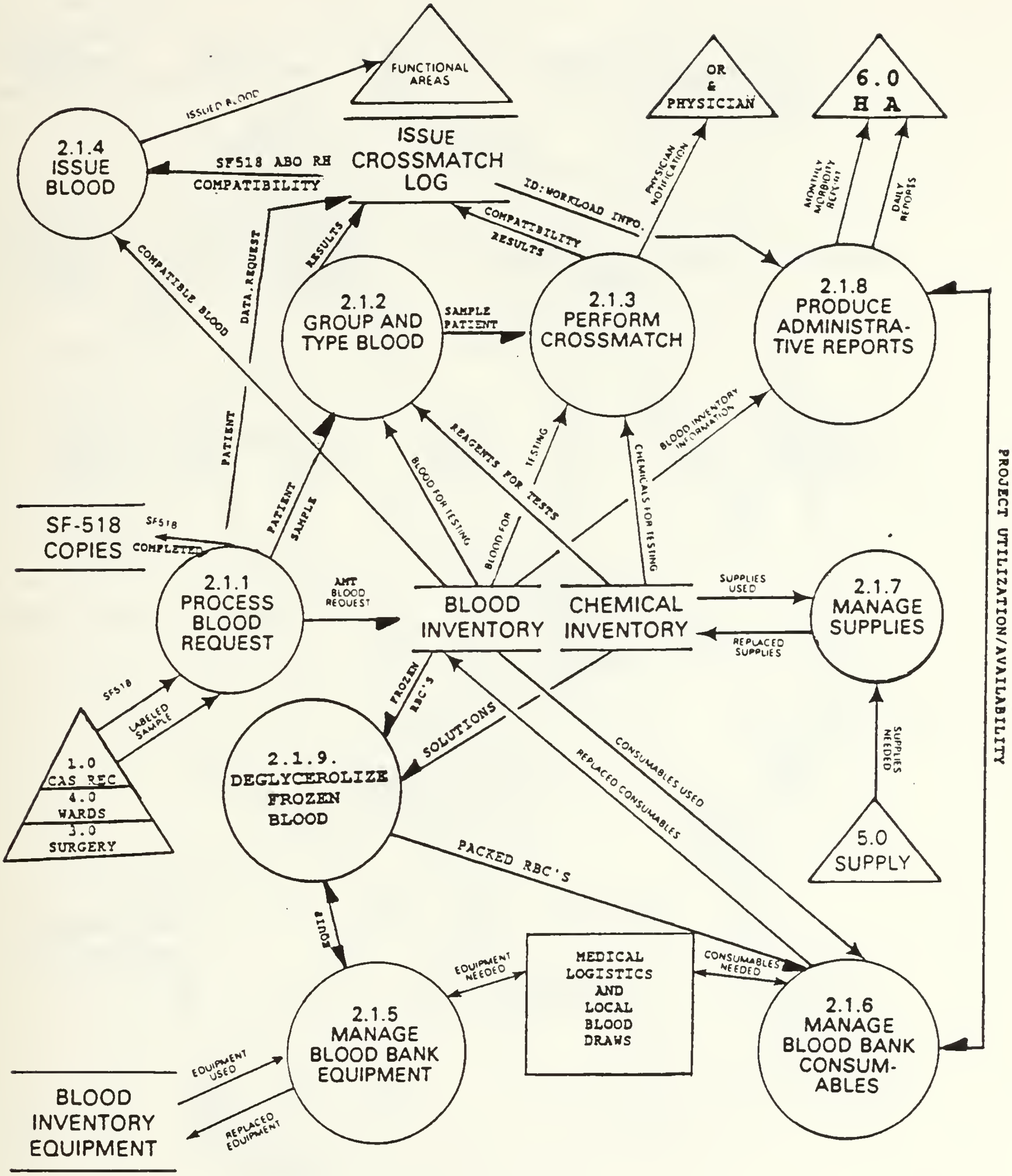
1.2.4 TREAT PATIENT



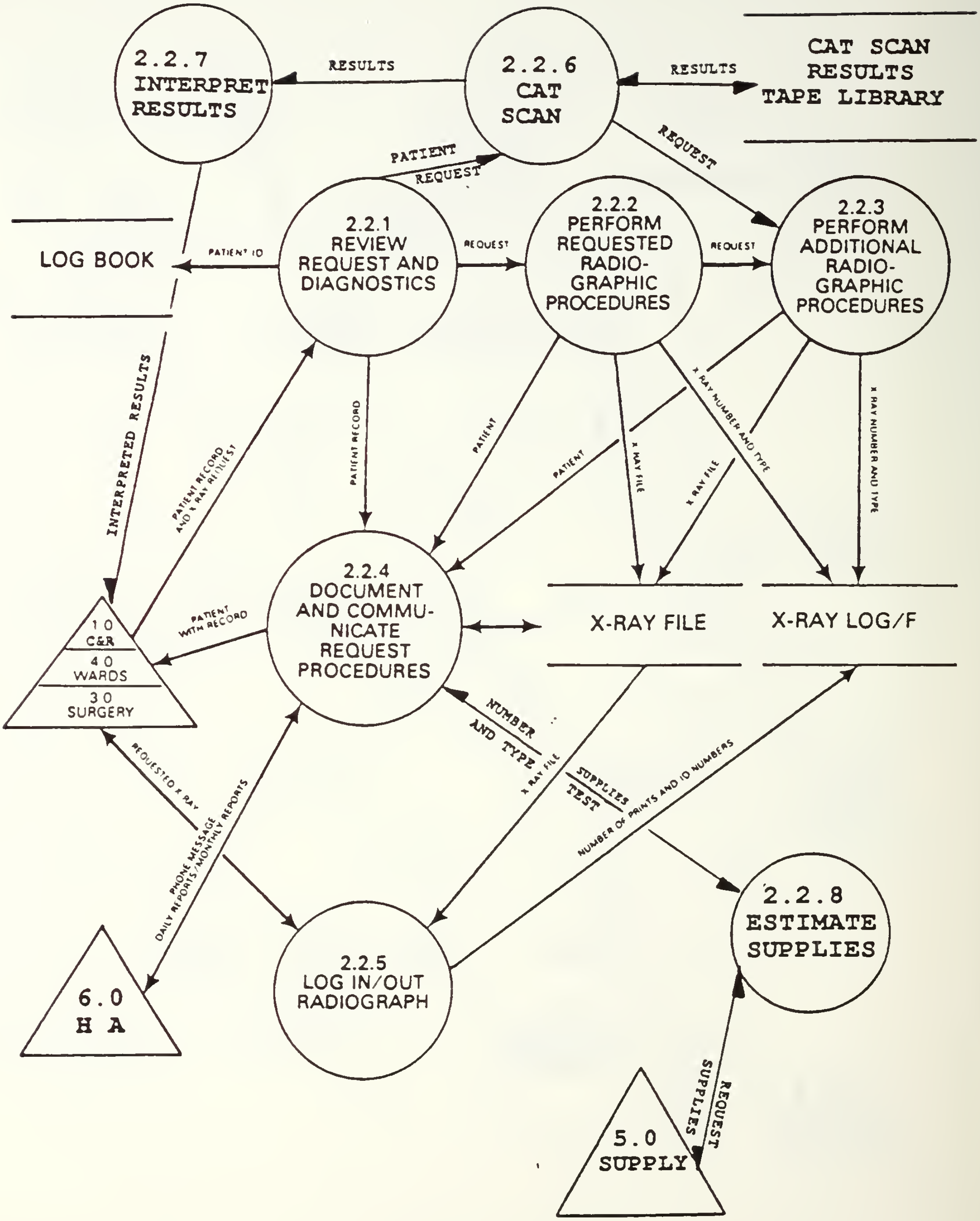
2.0 DIAGNOSTICS (DIAG)



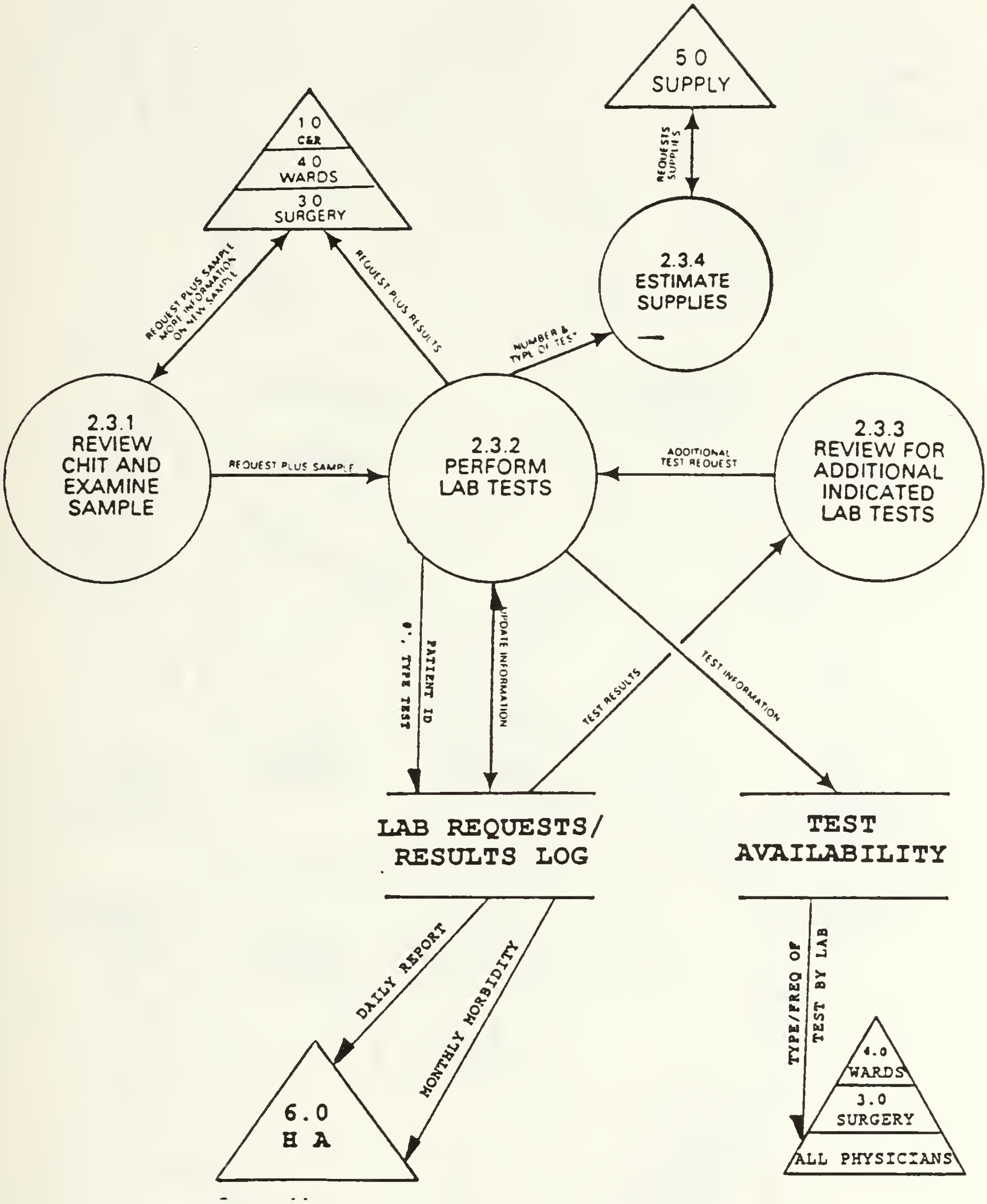
2.1 BLOOD BANK



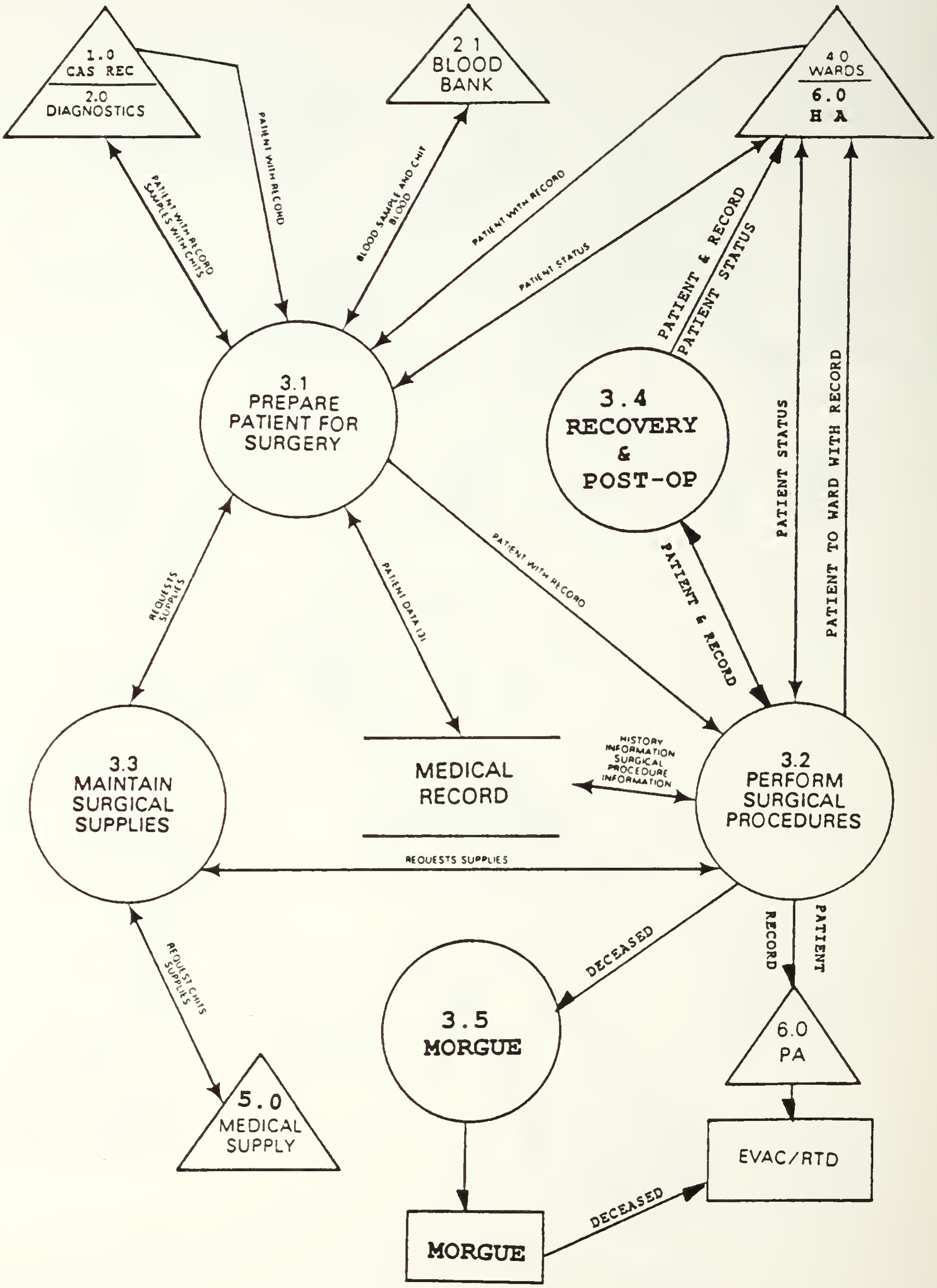
2.2 RADIOLOGY



2.3 LABORATORY (MAIN, STAT)

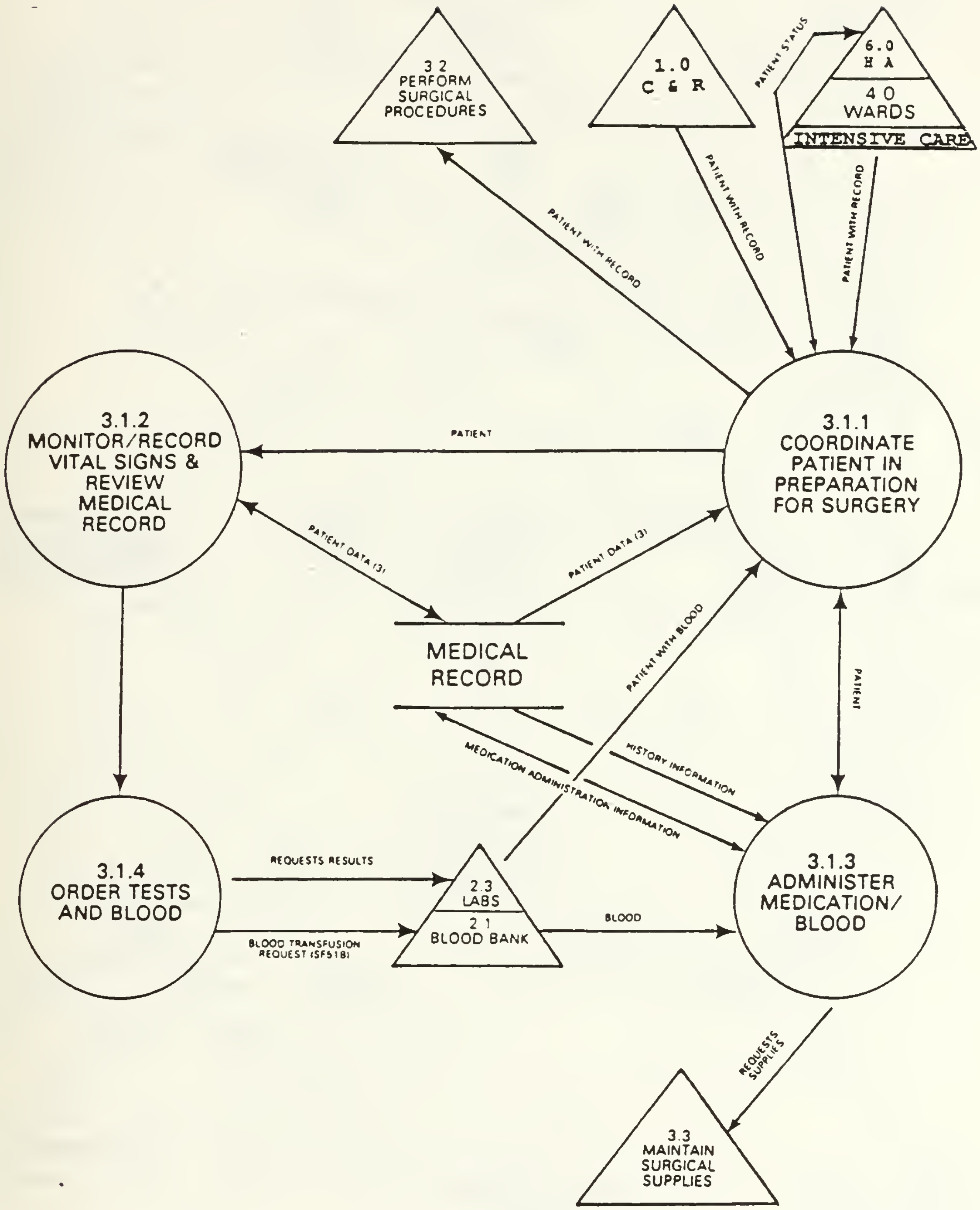


3.0 SURGERY

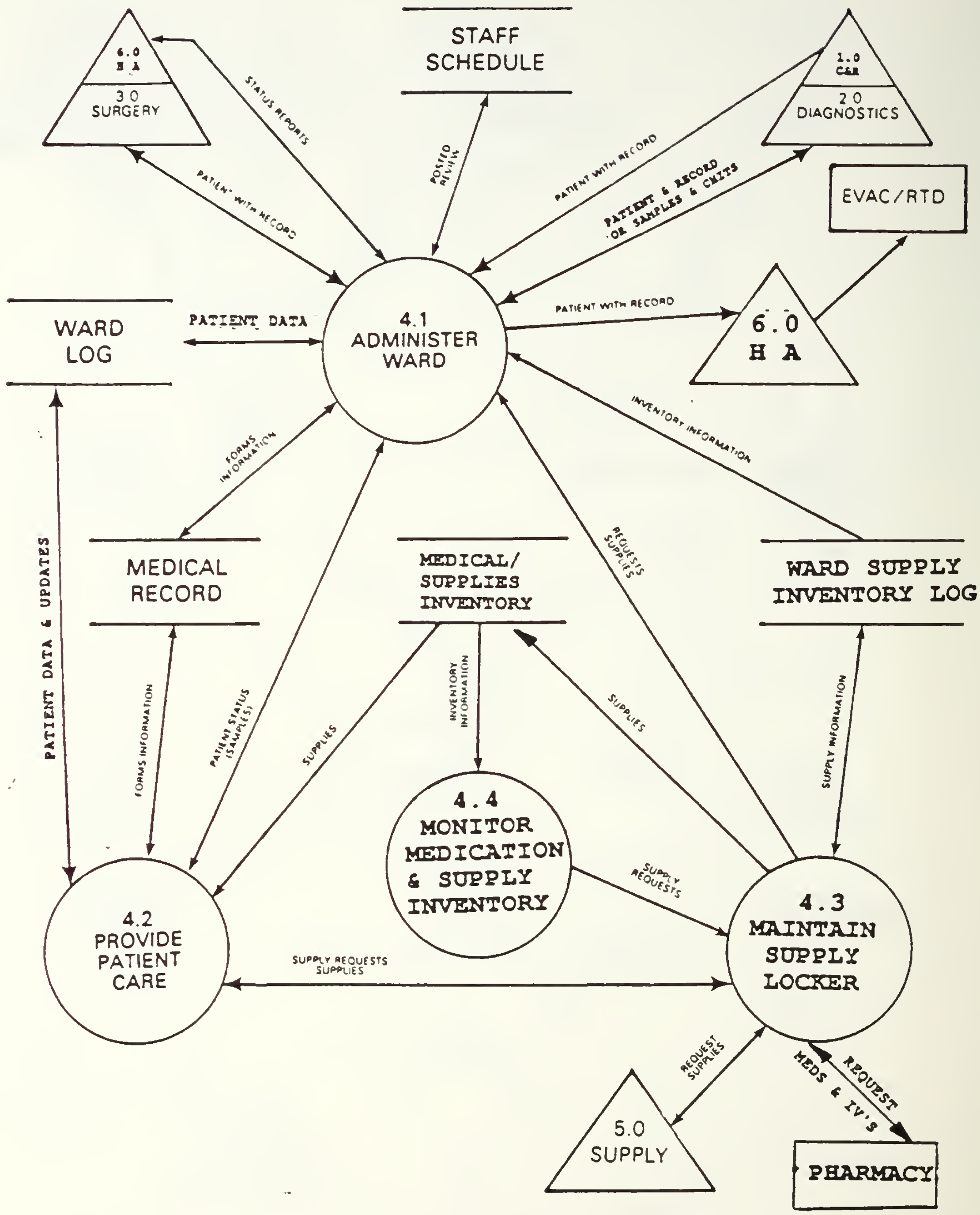


1.0
CAS REC
2.0
DIAGNOSTICS
2.1
BLOOD
BANK
4.0
WARDS
6.0
H A
PATIENT WITH RECORD
PATIENT WITH RECORD
SAMPLES WITH CHITS
BLOOD SAMPLE AND CHIT
BLOOD
PATIENT WITH RECORD
PATIENT STATUS
PATIENT & RECORD
PATIENT STATUS
3.1
PREPARE
PATIENT FOR
SURGERY
3.4
RECOVERY
&
POST-OP
PATIENT STATUS
PATIENT TO WARD WITH RECORD
PATIENT & RECORD
REQUESTS
SUPPLIES
PATIENT DATA (3)
PATIENT WITH RECORD
3.3
MAINTAIN
SURGICAL
SUPPLIES
MEDICAL
RECORD
HISTORY
INFORMATION
SURGICAL
PROCEDURE
INFORMATION
3.2
PERFORM
SURGICAL
PROCEDURES
REQUESTS SUPPLIES
REQUEST CHITS
SUPPLIES
DECEASED
RECORD
PATIENT
3.5
MORGUE
6.0
PA
5.0
MEDICAL
SUPPLY
EVAC/RTD
MORGUE
DECEASED

3.1 PREPARE PATIENT

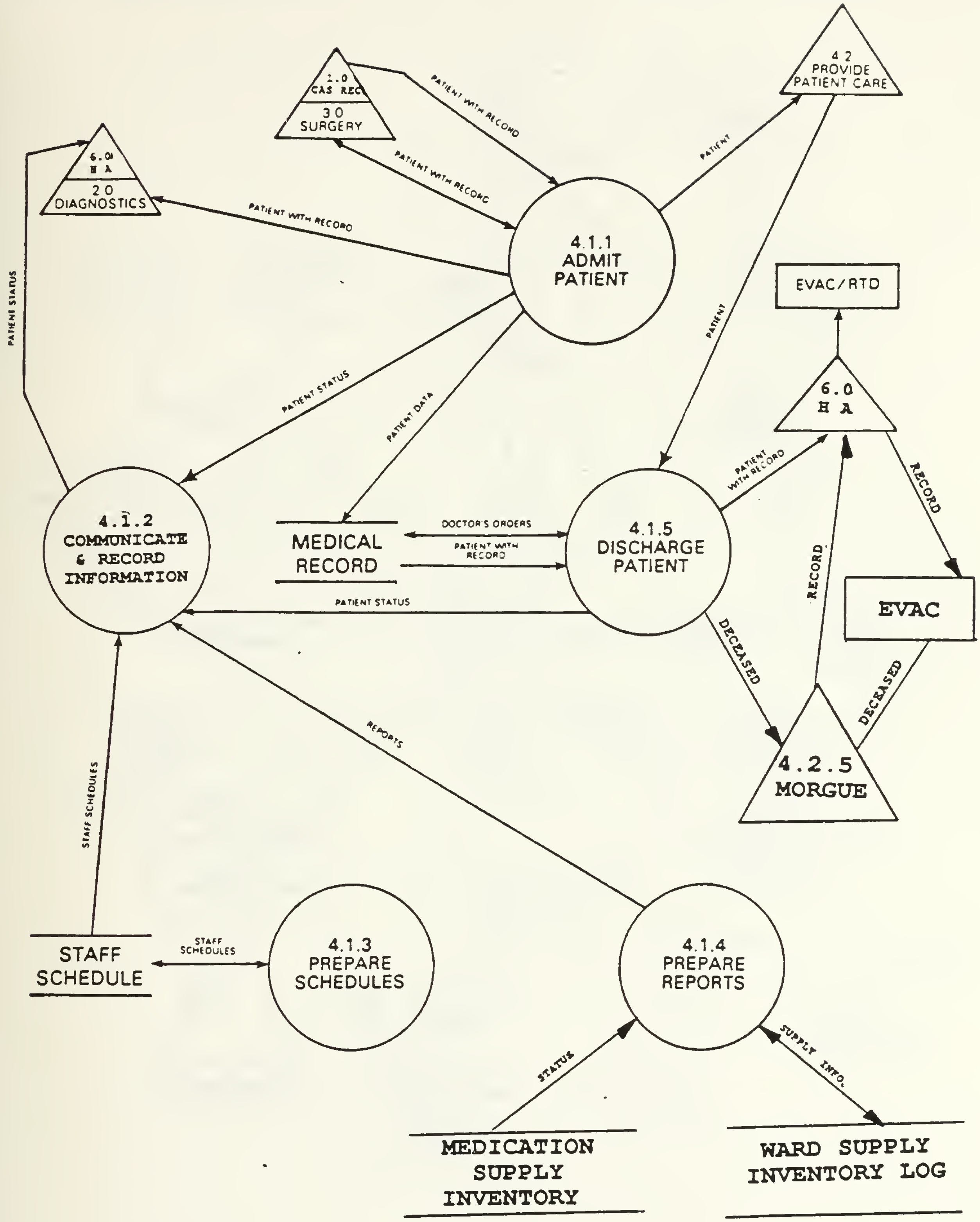


4.0 WARDS

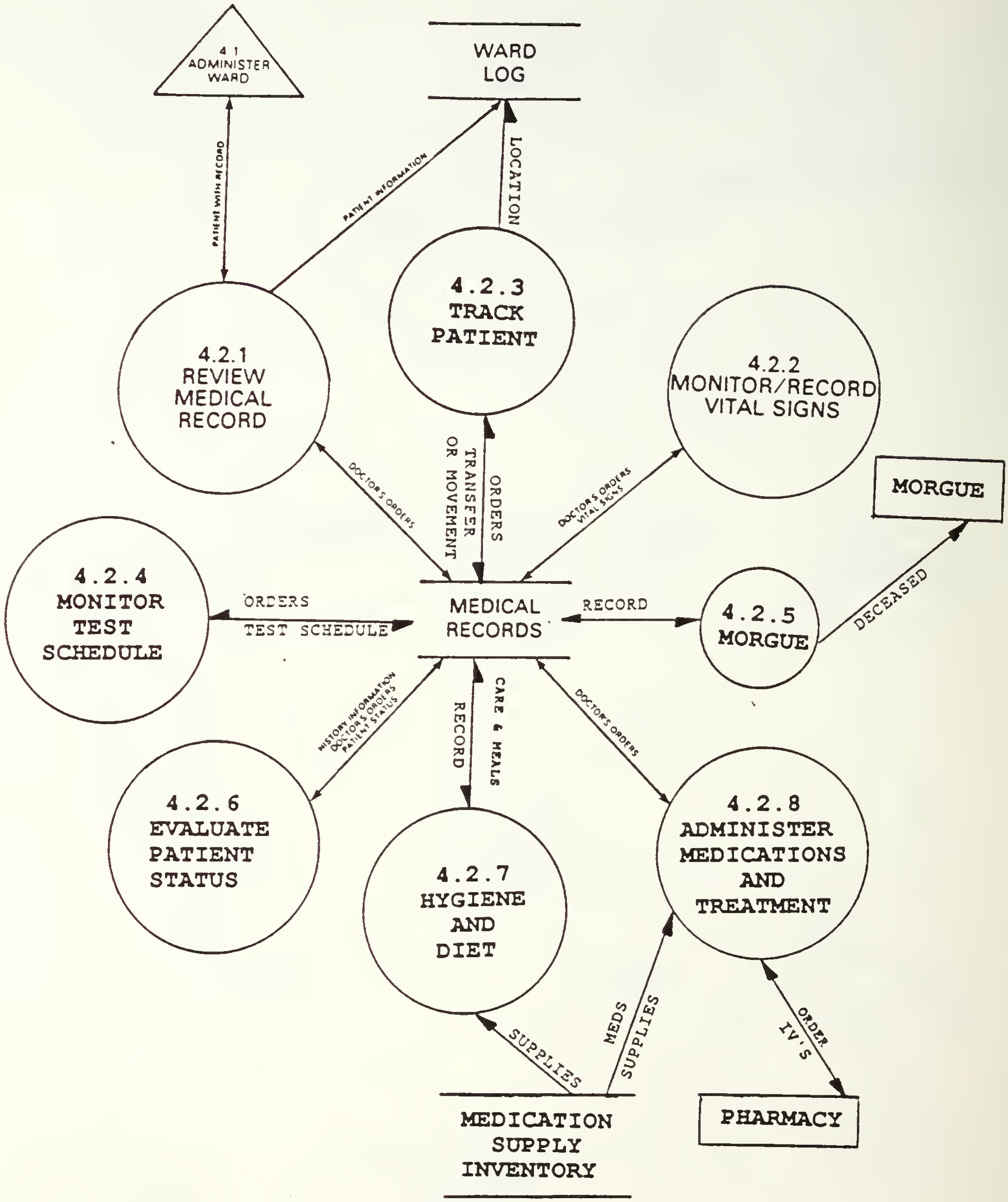


6.0 H A
3.0 SURGERY
STAFF SCHEDULE
1.0 C&R
2.0 DIAGNOSTICS
EVAC/RTD
STATUS REPORTS
PATIENT WITH RECORD
POSTED REVIEWS
PATIENT WITH RECORD
PATIENT & RECORD OR SAMPLES & CHITS
WARD LOG
PATIENT DATA
4.1 ADMINISTER WARD
PATIENT WITH RECORD
6.0 H A
INVENTORY INFORMATION
FORMS INFORMATION
REQUESTS SUPPLIES
PATIENT DATA & UPDATES
MEDICAL RECORD
MEDICAL/ SUPPLIES INVENTORY
WARD SUPPLY INVENTORY LOG
FORMS INFORMATION
PATIENT STATUS (SAMPLES)
SUPPLIES
INVENTORY INFORMATION
SUPPLIES
SUPPLY INFORMATION
4.4 MONITOR MEDICATION & SUPPLY INVENTORY
SUPPLY REQUESTS
4.2 PROVIDE PATIENT CARE
SUPPLY REQUESTS SUPPLIES
4.3 MAINTAIN SUPPLY LOCKER
REQUEST SUPPLIES
MEDS & IV'S
REQUEST
5.0 SUPPLY
PHARMACY

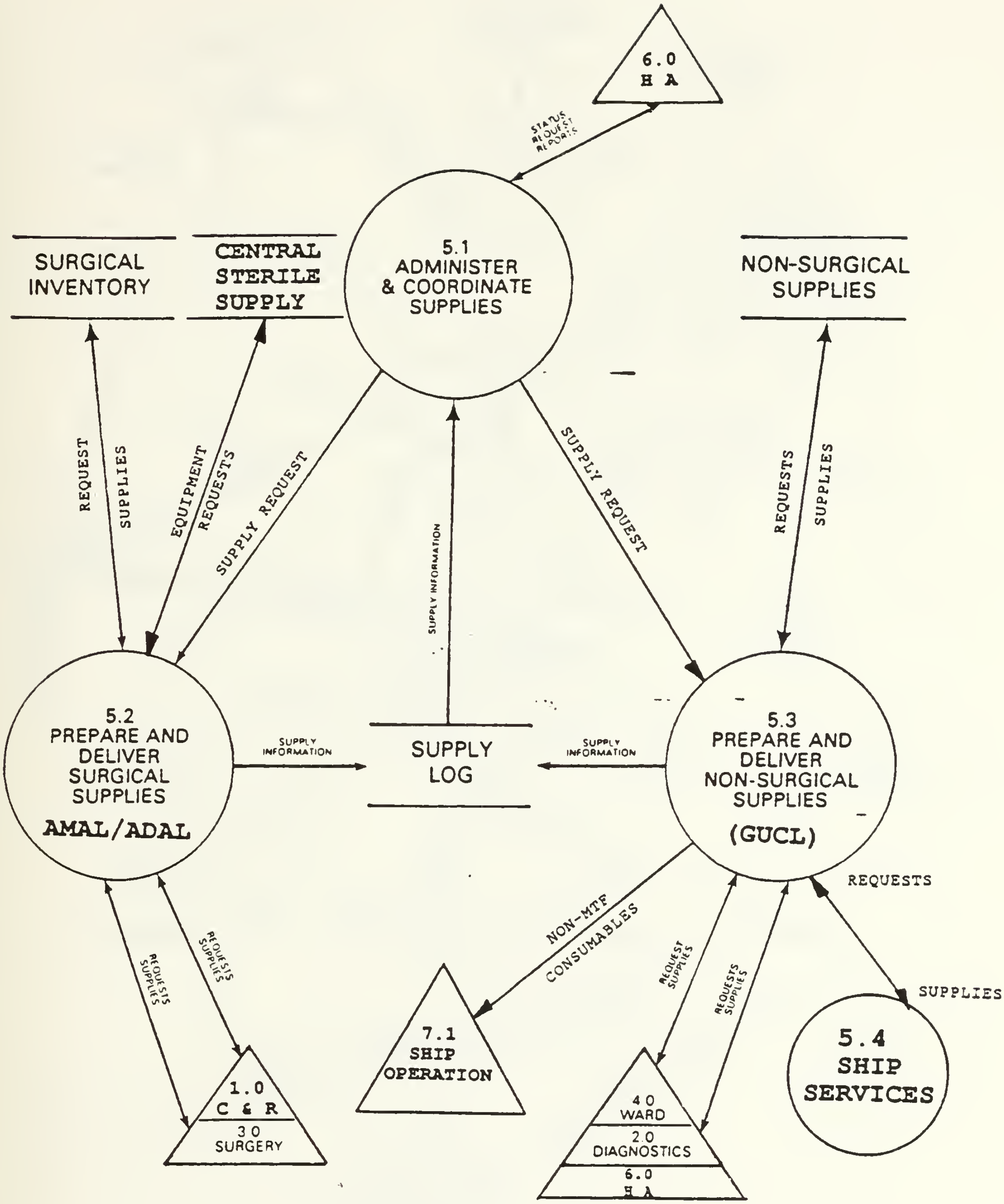
4.1 ADMINISTER WARD



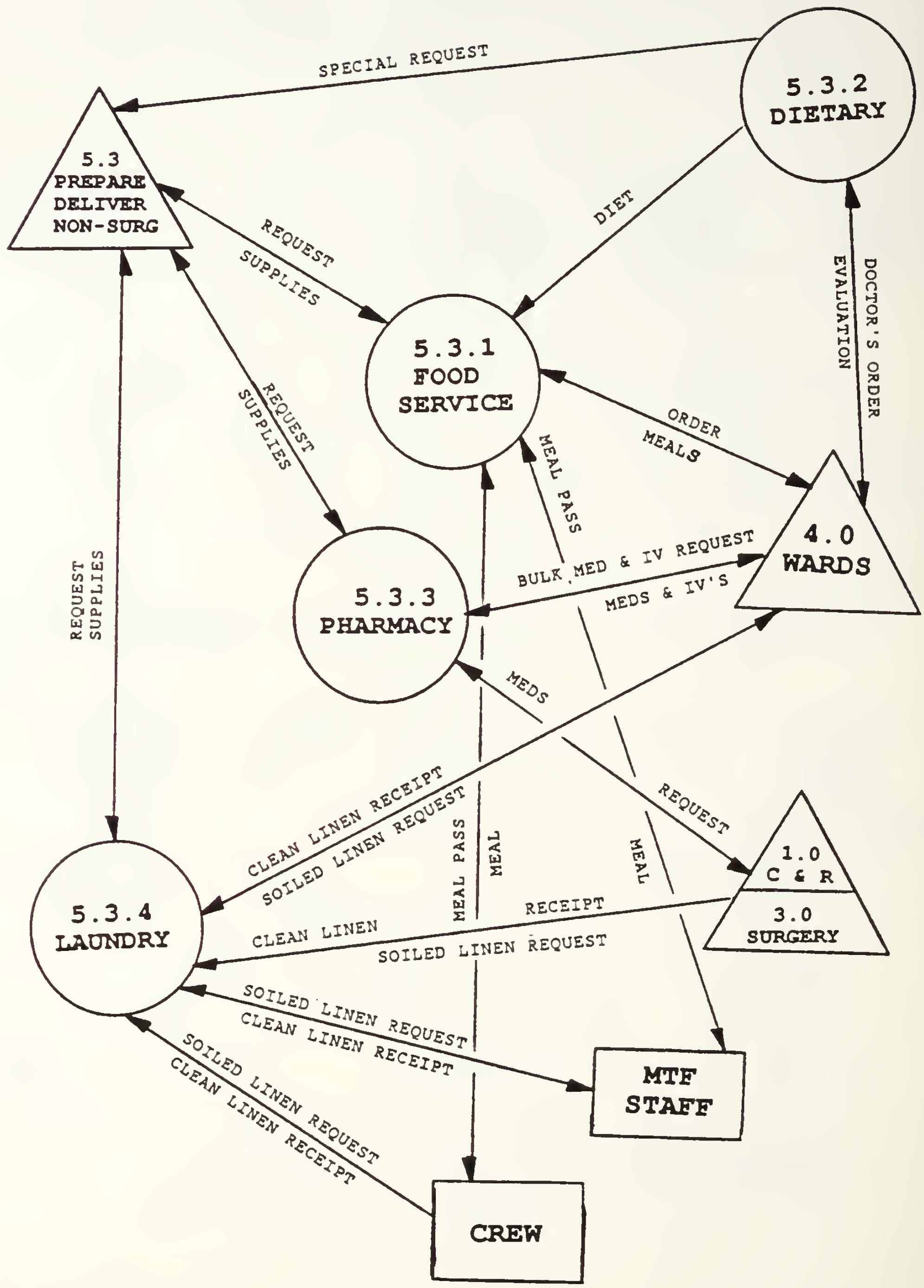
4.2 PROVIDE PATIENT CARE



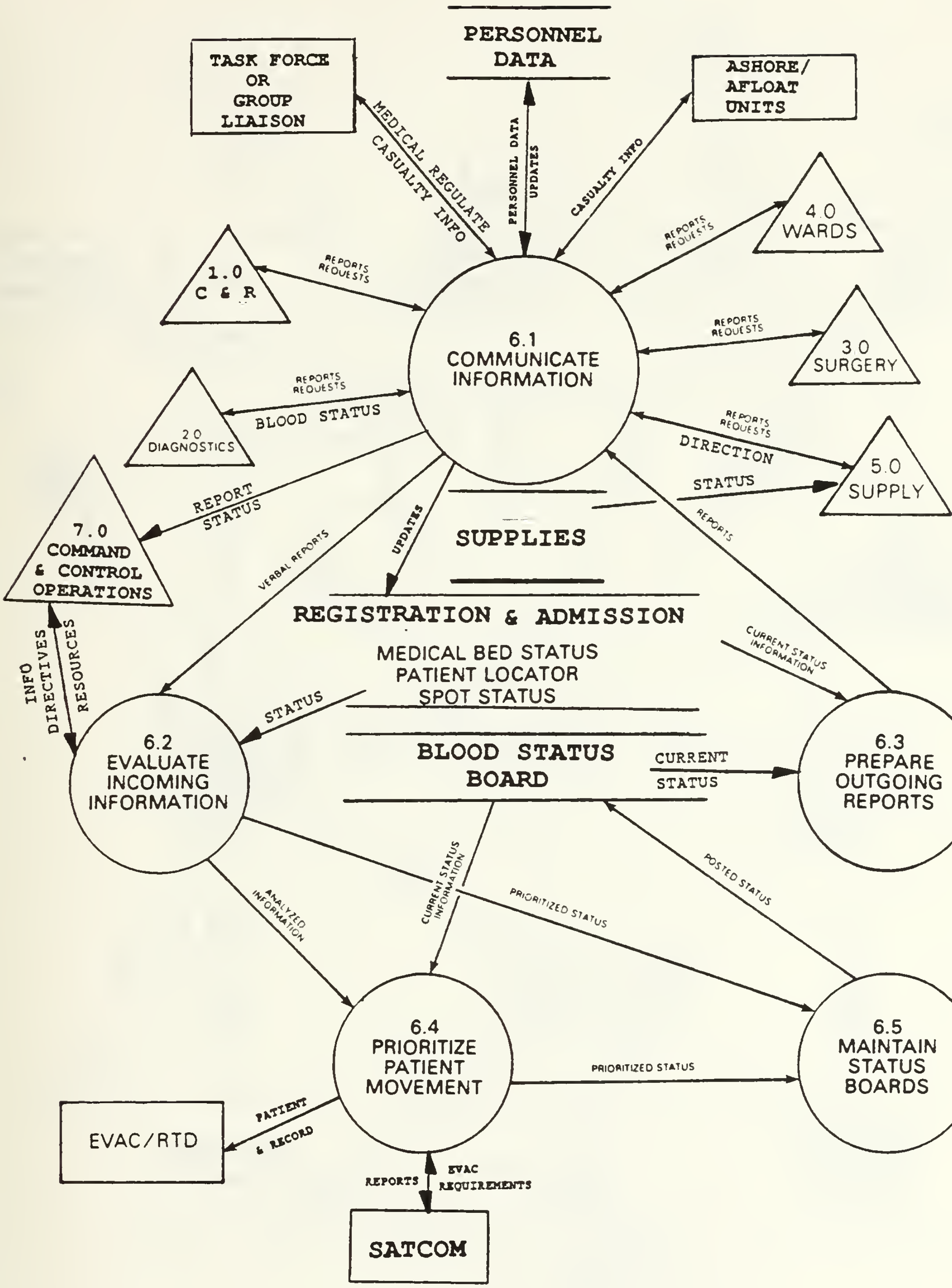
5.0 MEDICAL SUPPLY



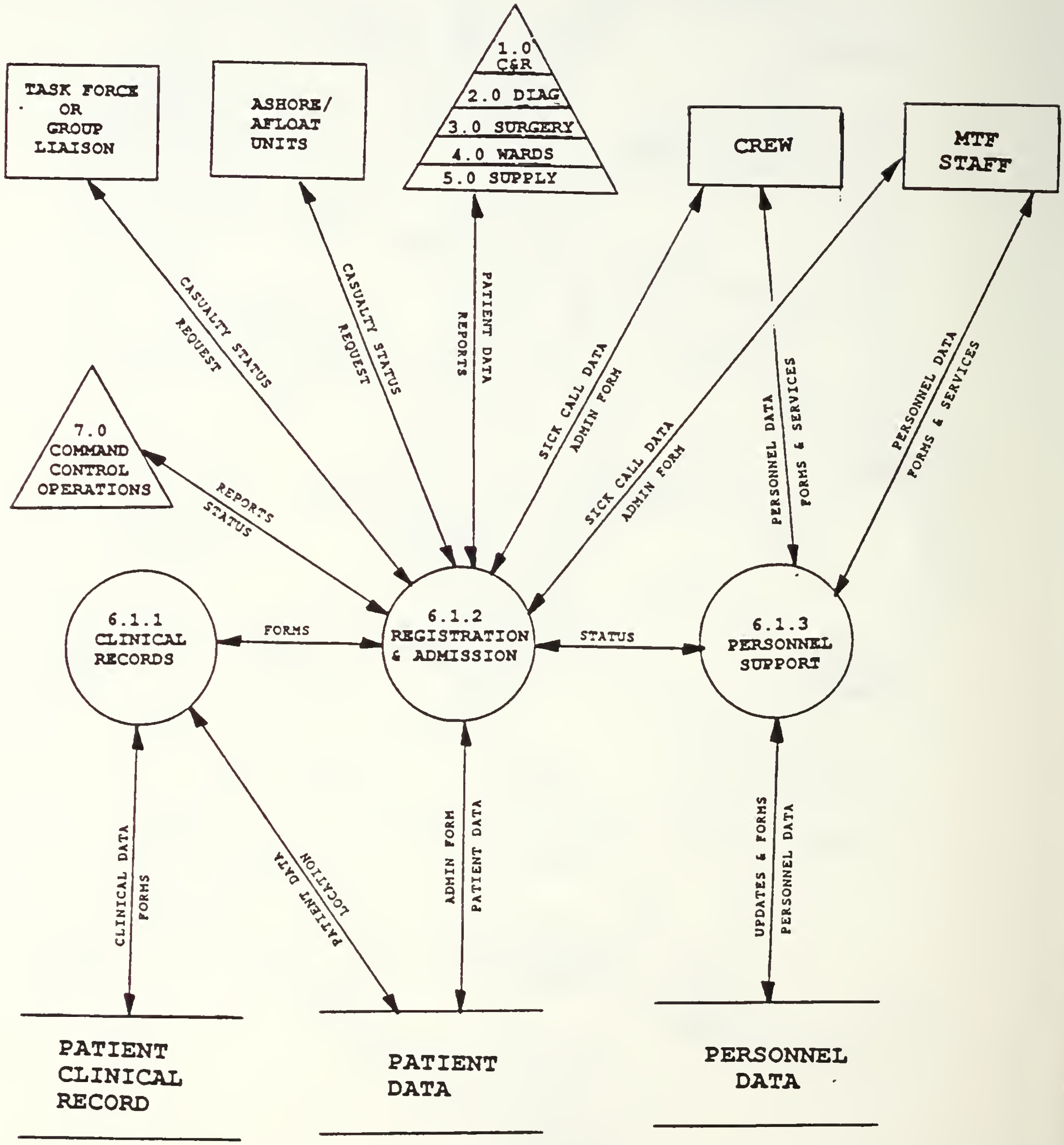
5.4 SHIP SERVICES



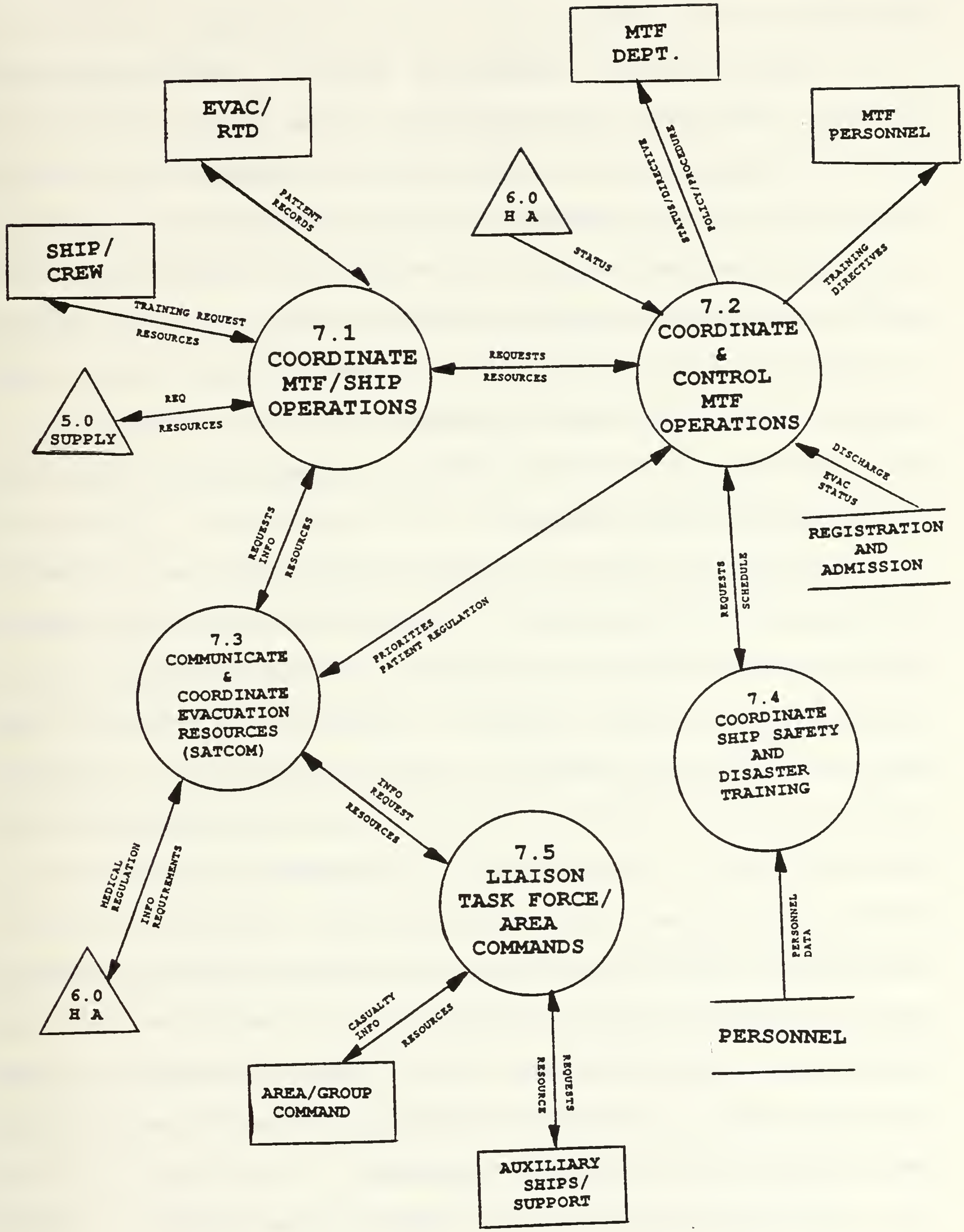
6.0 HOSPITAL ADMINISTRATION (HA)



6.1 COMMUNICATE INFORMATION



7.0 COMMAND AND CONTROL



HOSPITAL SHIP MTF LOGICAL MODEL

Narrative:

Each of these circles or bubbles identifying these processes are numbered and labeled. It was much more direct to label the main process in some cases as a thing or place e.g., Wards was used to indicate all the processes and activities involved in patient care on the ward. These labels were used because they are familiar to the medical personnel and provide an immediate mental image of the processes involved in that bubble. The non-medical personnel of the MTF may not be familiar with the activities of the ward bubble, but they will be familiar with the place(s).

Each of the seven processes at the 0.0 level of detail is numbered. To examine in more detail the process Casualty Reception, which is the first process to see casualties turn to the page of the model headed "1.0 CASUALTY RECEPTION". That page indicates two processes or bubbles taking place within the Casualty Reception bubble. These two bubbles are labelled "1.1 RECEIVING" and "1.2 EVALUATION". To examine in more detail the activity associated with "1.1 RECEIVING" turn to the page of the model by that heading. The next level of detail processing within receiving would be numbered 1.1.1 and so forth. The numbering system is the same for all the seven major processes e.g., activities associated with diagnosis would start with the number two and be numbered in sequence.

The rectangular boxes indicate the source or final

destination of the information. The arrows indicate the direction of information flow. Two headed arrows indicate information flowing in both directions. The parallel lines indicate data stores which could be files, records or filing cabinets. Information can be drawn from, deposited in or withdrawn for update and returned to data stores. Triangles indicate information flow to a process or activity not described on that page. These off-page processes can be readily traced by their number.

Referring to the logical model the casualty or humanitarian patient enters the MTF via the side port access or by helicopter. The patient will then follow the flow indicated in Appendix C. This patient flow drives the information flow as indicated by the logical model. However patient information is pervasive and spreads throughout the MTF, to the unit commanders, and to outgoing reports. The logical model indicates a varied source of casualties depending on the mission and situation.

a. Casualty Reception

Casualties or patients may be received from different sources indicating various levels of prior treatment. As casualties arrive they enter "1.0 Casualty Reception", where litter bearers are provided for the non-ambulatory. The litter patients are taken by elevator or ramp to the casualty reception compartment. Ambulatory patients are directed to casualty reception by ramp or elevator depending on

availability. Prior information regarding the number of litter patients is necessary to make this as efficient as possible. Rapid movement of patients is necessary to speed treatment, to free the receiving area for more arrivals, and to remove the patient from the elements. Patient data collection from dog tags or the U.S. Field Medical Card (DD1380) starts immediately upon arrival. Patient items such as weapons and clothing are tagged with patient identification. Weapons, if any, are stored in the Armory and may not enter the MTF.

Depending on the patient's source triage may have already been performed. The DD1380 or patient record if available will provide triage category and prior treatment information. Depending on the patient's condition and available treatment positions in casualty reception triage may be repeated. The patient's condition may have changed due to the mode of travel, time of travel or injury process. Resuscitation and treatment begins while identification and previous treatment information is taken from all available sources e.g., the patient, DD1380, or medical record. Patient identification is used to complete admission and registration forms recording patient presence at the MTF. This information is sent to "6.0 Hospital Administration." An identification wristband is created for future patient identification. A chart or medical record is created from standard medical record forms e.g., Abbreviated Medical Record (SF589), Doctors Orders (SF508), Vital Signs Record (SF511), Shock/Trauma Record, Blood

Transfusion Request (SF518), and other diagnostic test requests for effective continuity of care. If present, the DD1380 is added to the chart. The absolute minimum identification required on a form or wristband is a unique patient registration number. However, the FMF Medical Information Systems Requirements Definition Workshop identified the following information as required at all echelons of care for patient identification; name, SSN, unit, allergies, blood type and religion. These are the data usually recorded on the common Dog Tag. Still, many minutes are required to record patient identification and vital treatment data.

Meanwhile, the patient must continue to receive initial treatment which may include starting intravenous fluids, controlling hemorrhage, maintaining patient's airway. It is generally accepted that the search and collection of patient demographic data is vital but it must not impede initial treatment. Generally, blood specimens and lab specimens are collected and transported to the laboratory, "2.0 Diagnosis," while the patient is in Casualty Reception. X-rays, if required, are ordered from Casualty Reception and the patient may proceed to "3.0 Surgery" from Radiology or return to Casualty Reception.

Depending on the severity of injury and availability of resources, after initial treatment and admission the patient may be sent to the "4.0 Wards" for later surgery, treatment, tests or X-rays. The Hospital Ship was designed under the

assumption that sixty percent of the casualties will require surgery.

As consumable supplies run short in the treatment carts and storage lockers in Casualty Reception requests for supplies are sent to "5.0 Medical Supply." These requests may be sent verbally by telephone in emergencies or sent by runner on standard forms. The requested supplies (if available) will be delivered by supply personnel.

b. Diagnostics

The bubble "2.0 Diagnostics" represents all the processes involved in Radiology, Blood Bank, Main and Stat laboratories. Requests for services could be sent from any patient treatment area. Except for Radiology the other areas may never see the patient. Their only contact is via the request form and lab sample. Radiology may verify that the proper radiographic procedure is being done on the correct patient by comparing the wristband. The Blood Bank and the labs depend on specific information on the specimen and lab request. Basically the patient information on the sample and the request must completely agree. The specimen must be adequately identified and generally a single patient registration number is not sufficient. Relying on a single several digit number allows too much room for human error. This error can occur when labeling after being drawn or in the lab where all blood specimens look alike. Therefore current CONUS MTF laboratory policy insists upon patient name, SSN, patient

registration number, location requesting, tests or procedures requested and doctor requesting. The diagnostic areas must work closely with "5.0 Medical Supply." They are heavy users of bulky consumables i.e., solutions and reagents. Most of these reagents have expiration dates. These expiration dates must be diligently managed by the labs and medical supply.

Radiology must receive the procedure request, record the request, determine correct resources for the procedure, schedule, and complete the procedure. This may mean the patient waits until the required room or CAT scan is available. This wait may take place in Casualty Reception, a holding area or on the Wards. If the patient's condition is too severe then Radiology may be by-passed in some situations and portable X-rays taken in Surgery. Unique patient identification data is required for the X-ray film and jackets they will be stored in for transfer with the patient. No facilities exist to archive X-ray results. The X-ray film must show the type procedure (angle) and patient name, number, and date. The same information required for the CAT scan tapes. The results of the procedure and film are sent to the location required as specified on the procedure request form. The patient and procedure results are logged in/out. Hospital Administration, Casualty Reception or the Ward (whichever is appropriate) is notified that a non-ambulatory patient needs a stretcher bearer. Ambulatory patients can be escorted by stretcher bearers or make their own way back to the ward.

The Main and Stat laboratory will provide a listing of all tests performed, frequency of test, correct form, and specimen collection technique to all physicians, treatment areas, and Hospital Administration. This list may be modified depending on reagent, supplies, personnel, and equipment resources. These changes will be provided to Hospital Administration, who will communicate the changes as necessary. The Main and Stat laboratories will record the request in the log with the time, urgency, patient identification, location, and procedure(s). The labs will perform the procedures as required and record the results in the log and on the request. Depending upon the urgency and nature of the test the Main lab may call back the result or file it in the ward mail box. The Stat lab will routinely call back results. Both labs may do further testing to assist in diagnosis and may need to request more specimens.

The Blood Bank provides immunohematology, blood and blood component management. It requires the same patient information as the other diagnostic areas. In addition, the SF518, transfusion number, patient blood group and type, donor unit number, major and minor cross match, compatibility results, signature of technician, date, time, and signature of person picking up the blood is recorded in the blood issue log. The blood bank manager requires expected use requirements from Surgery and Hospital Administration to properly manage the MTF scarce blood supply. Although the blood bank freezers contain

3,000 frozen units of blood. About an hour is required to properly process a frozen unit for transfusion. This process of deglycerolization requires constant technical attention and consumes large amounts of sterile solutions. The blood bank manager must keep the proper mix of packed red blood cells (RBC) and frozen units to give prompt efficient service and prevent waste.

c. Surgery

Surgery basically consists of the following areas; pre-operation patient and holding, operating rooms, anesthesia workroom, and recovery room. The patient on the way to "3.0 Surgery" will have been decontaminated, admitted, and stabilized on the way through casualty reception or from a ward. The patient's chart or medical record continues to be updated with data regarding treatment, vital signs, medications, doctor's orders and injury condition. All of this information has been recorded on standard medical forms. Surgery will add a few more such as, Operation Report (SF516), Anesthesia Report (SF517), SF518's and more lab requests. The surgeons and the surgical nursing staff schedule the patient on a priority basis. This is based upon rooms available, number of casualties arriving, type of surgical procedure required to treat the injury. Patient identification is essential in the Surgery process for effective care. Following the surgical procedure the patient is sent to the Recovery Room for post operative care and monitoring. A central electronic patient

monitoring station can be used to follow patient progress out of anesthesia. Depending on the doctor's evaluation of the patient's condition after recovery the patient may be transported by stretcher to the "4.0 Ward" which can best provide the level of care necessary. Hospital Administration will be notified of the bed requirement and assign the bed. Medical Supply will be notified of any restocking requirements.

d. Wards

The MTF provides the following ward bed capacities in decreasing order of patient care capability; Intensive care 80, Intermediate care 280, Light care 120, and Limited care 500 beds. The capabilities on these wards can be adjusted as required within the constraints of equipment, personnel and supplies. The Ward is the primary holding and care location for the patient. A bed will be assigned each patient based on clinical condition and availability by Casualty Reception, or Hospital Administration.

The Ward will be primarily responsible for the patient's location, ward supply room, treatment, maintenance, ward medication locker, medical record (chart), and clinical improvement. The Ward will receive medication in bulk from the Pharmacy and IV's as needed. The Ward must ensure all information is recorded in the medical record. All the standard forms previously mentioned are used or reviewed including Nursing Notes (SF510) and Progress Notes (SF509).

The ward must communicate with all areas of the MTF in the process of caring and documenting care for each patient. This communication will be by phone and or standard form. It is anticipated that the patient will move from intensive care toward to limited care wards depending on clinical condition and need for intensive or acute care beds. Patient stay was planned at five days. This depends on the availability of evacuation transport. If evacuation transport is available the patient may be evacuated at any time after stabilization. The ward will assist Hospital Administration in this evolution by preparing the patient.

e. Medical Supply

The "5.0 Medical Supply" function has been merged with the overall ship Supply Department. Only those functions in direct support to the MTF are depicted in the logical model. Supply functions associated with ship operations is outside the scope of this thesis. Medical Supply is manned by medical and non-medical personnel. These personnel will provide the major source of manpower for transport teams and stretcher bearers. They are responsible for security, accountability, logistics, and availability of supplies, equipment, and services relating to the AMAL/ADAL, and medical consumables. They will communicate with all areas of the MTF by phone and standard form. Operation and staffing of food services and laundry are Supply functions. The ward must inform the galley of the number of patients and diet required. Medical Supply will

stock all satellite storage areas in casualty reception, wards, treatment areas, labs and surgery. Medical Supply will respond to emergent requirements, but will routinely stock storage areas at times of minimal patient traffic. They will keep Hospital Administrative informed of supply status. They will be responsible for resupply logistics, inventory, and movement of supplies.

f. Hospital Administration

Hospital Administration is responsible for the administrative aspects of patient care, MTF directives/policy, and coordination between the other major processes in the logical model. More specifically they do, disposition, medical regulating (EVAC), clinical records, collect medical statistical data, maintain MTF personnel records, manage the morgue process, monitor patient admissions, interface with the Ship's Master and all MTF outgoing reports. Hospital Administration is the information hub of the MTF. All patient demographiic information and MTF support information goes through Hospital Administration. Hospital Administration is responsible for staffing, training, MTF standard procedures, and management plans. The following essential operation status boards must be maintained and available at all times; Personnel Status, Admissions/Registration Status, Bed Status, Patient Location, Blood Available, and Spot Status.

The Personnel Status Board should show; name, rank, primary duty station, berthing space, cross training

(additional qualifications), watch rotation, watch station, and status e.g., on duty, leave or sick in quarters (SIQ).

The Admissions/Registration Board should show; patient name, registration number, date of arrival, evacuation status e.g., ready or pending, and injury type.

Bed Status should show ward name, ward bed capacity, number of beds occupied, and number of beds available for each ward.

Patient Location consists of patient name, registration number, ward assigned, current location, and evacuation status. Current patient location is essential due to the size, complexity, and limited manpower. The safety of the patient in case of disaster depends on the location. Also, evacuation resources are expected to be scarce and the patient must be locatable to coordinate debarkation.

Spot Status consists of total bed capacity, beds occupied, number of patients waiting surgery, surgical backlog in hours, casualty reception backlog, total casualties onboard, number of casualties by combat unit, total number of patients requiring evacuation, number of patients assigned to known evacuation flights, and number of patients waiting evacuation resources.

g. Command and Control

The "7.0 Command and Control" bubble relates the following processes; coordinate ship/MTF operations, coordinate and control MTF operations, coordinate ship safety and disaster

training, communicate and coordinate evacuation resources, and communication with Task Force, Group or Area Commanders. Many MTF and ship evolutions are a joint effort. Many support functions and services are common to both ship and MTF. Coordination is required at the functional level. Coordinate and Control MTF was discussed under Hospital Administration. Safety and disaster training such as fire, lifeboat drills, etc., are seen as essential for all crew/MTF staff and deserve constant attention. Safety of the all patients and ship's personnel cannot be over stressed. In addition, occupational health and safety, Coast Guard, Naval regulations must be effectively enforced throughout the Hospital Ship.

Communicating and coordinating evacuation resources may include requesting helicopter evacuation resources from the Commander, Amphibious Task Force (CATF) or the Commander, Landing Force (CLF) by radio. It might also include using satellite communication (SATCOM) to interface with the Defense Medical Systems Support Center (DMSSC) standard systems. This SATCOM interface may be with the Defense Medical Regulating Information System (DMRIS) which connects with the Armed Services Medical Regulating Office (ASMRO) and the Automated Patient Evacuation System (APES) to provide evacuation of patients from overseas via European or Pacific air evacuation squadrons to CONUS MTF's.

APPENDIX F

SNAP II SUBSYSTEMS

Description: This provides more detailed specifications about the SNAP II subsystems. This will increase the reader's understanding of SNAP II capability.

SNAP II SUBSYSTEMS

System Management Subsystem provides system management and system support services to the other functional subsystems. It supports (NAVMASSO Doc. X-6093-001):

- o system security and controls user access
- o maintains system configuration and organization data
- o controls input/output operations such as, read/write to magnetic tape and floppy disc files
- o manages peripheral devices (e.g., printers, workstations)
- o backup and recovery of the SNAP II system
- o program and utility maintenance
- o supports electronic mail
- o supports word processing and message generation

The Supply and Financial Management Subsystem is an interactive screen driven subsystem which supports requirements processing, inventory management, financial management, supply control, and Integrated Logistics Management (ILM). Requirements processing provides for the input, issue, ordering, status tracking, material receipt, and automated single-line editing. Inventory management processing provides for stock item management of Hull, Mechanical, Electrical, and Electronic Coordinated Shipboard Allowance List items. Financial management processing provides budget management and issues financial reports. Supply control processing provides the ability to establish user access levels, display reports, print a transaction ledger, and create a history tape. ILM provides repair parts management via inventory control and allowance determinations. (NAVMASSO Doc. S-1059-005)

Administrative Data Management Subsystem (ADM) subsystem is an interactive screen driven system providing manpower

management, query, visitor control, and display print functions. Manpower management supports berthing, alpha and duty rosters, career counselor, training and school history, lifeboat muster and alpha lists, personnel records management, and prints medical reports. ADM allows the user to custom make routine queries and keeps them for later use. (NAVMASSO Doc. Q-002, SS-001 A)

Maintenance Data Subsystem provides on-line interactive management of ship maintenance and repair files. It supports maintenance tracking, equipment calibration, and maintain preventive maintenance data bases. This sub-system is primarily a ship support function but will also be used for medical equipment and spaces support. (NAVMASSO Doc. SB-001)

APPENDIX G

SAMMS MODULES

Description: This provides the reader more detail about the SAMMS modules. This provides a more in-depth view of each modules capabilities.

SAMMS MODULES

The Master File module enters the member's health record into the system, allows retrieval and update, and prepares standard reports. The Medical Encounter module documents and reports accidents, injuries, emergencies, routine sick calls, follow-ups and referrals and generates disposition reports. The Radiation Health module documents information required for the radiation health program monitoring and reporting. The Occupational Health and Environment Surveillance module provides the capability to monitor shipboard conditions and activities which might endanger the crews health such as water contamination, heat stress, and sanitation. Training management monitors shipboard and readiness training requirements. The Supplies Management module manages AMAL/ADAL inventory control, monitors expiration dates, tracks location of supplies, and assists in the development of supply and equipment replacement lists. The System Maintenance module allows interface with SNAP II, systems security, program maintenance, and networking support. (DMSSC, 1987)

APPENDIX H

BASIC AQCESS MODULES

Description: This provides the reader a more detailed view of the capabilities of the individual AQCESS modules.

BASIC AQCESS MODULES

The Admission and Disposition module provides screen driven data entry for patient registration, admission, transfer, bed management, inpatient history and reporting. Ward index card with patient identification is automatically generated, which also facilitates wristband creation. A standard form speed letter or message is formatted for each patient on admission to inform the patients unit, but it is not automatically printed. Patient admission and registration is automatically recorded on multi-part standard pin feed forms.

The Clinical Records module automatically records documentation about diagnosis and procedure, patient stay, record tracking, reporting and creates a clinical record checklist. However, it does not support medical transcription.

The Quality Assurance module supports inpatient occurrence screening, problem tracking, provider profiles, credentialing, incident reporting, blood utilization review and reporting. This module provides a short concise provider profile and credentialing report which facilitates quick data entry at the providers new duty station.

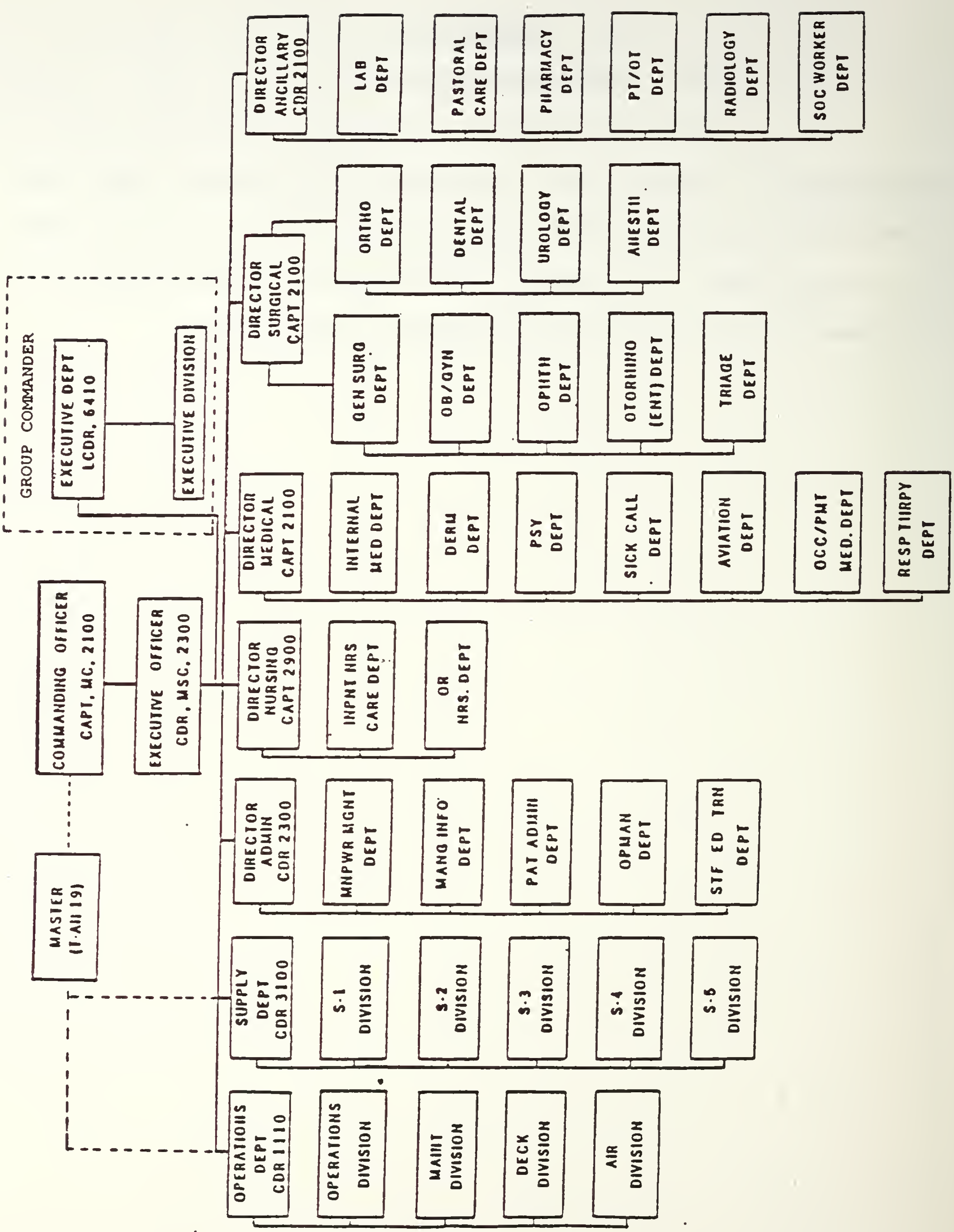
Although many standard reports e.g., patient roster, bed status, ward reports, number of patients by injury type, can be produced automatically at the same time(s) each day, ad hoc reporting is also supported. Any standard report or any mix

of data fields in the data base can be used to create a custom report. This allows the users to produce reports that meet the MTF's immediate and special recurring needs.

APPENDIX I

ORGANIZATIONAL CHART

Description: This chart indicates the Mercy Class MTF organizational structure as proposed for the primary mission. It is provided to assist the reader's understanding of departmental and executive management relationships.



I-1 Organizational Chart

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